4 PROPOSED PROGRAM

This chapter contains detailed recommendations for proposed modifications along the SR 29 corridor, consistent with the Vision outlined in Chapter 3. Improvements that address all modes of travel—automobile, transit, bicycle, and pedestrian—are described and illustrated for major segments and key intersections. Each includes a description of:

- Current conditions;
- Alternatives considered (if applicable);
- Proposed improvements;
- Projected operations and performance assessment; and
- Design considerations and any physical or infrastructure constraints (if applicable).

Plan and section diagrams, photos, three-dimensional illustrations, and other graphics provide additional guidance and illustrate desired outcomes.

These recommendations collectively form the basis for preliminary cost estimation, financing, and other implementation actions to be undertaken by NCTPA and other participating jurisdictions.

METHODOLOGY

Travel Demand Forecasting

SR 29 draws vehicular traffic from all across the region; therefore a multi-county model that tracks trips from the region and accounts for land use changes both in and outside of Napa County was best suited for this study. The Napa-Solano Travel Demand Model (N-STDM) was the most appropriate tool to perform traffic forecasting for the SR 29 corridor.

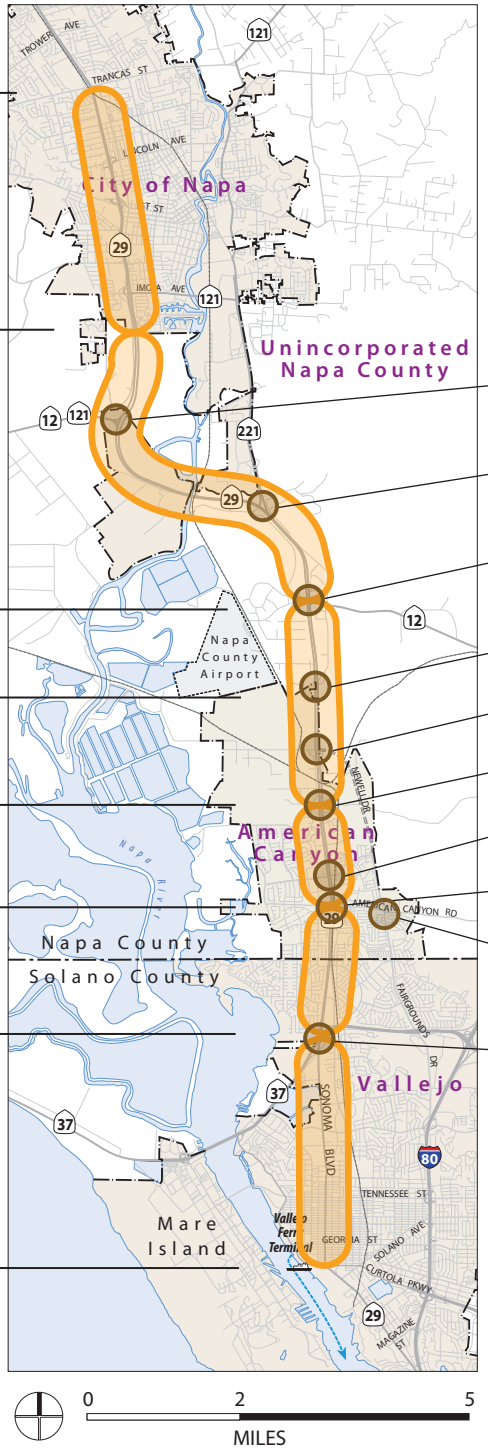
To ensure the most recent land use and network inputs in the study area were represented in the N-STDM, Fehr & Peers reviewed relevant data sources: the American Canyon General Plan Circulation Element Update (2012), MTC's Transportation 2035 Plan for the San Francisco Bay Area (2009), the Napa County General Plan (2009), and ABAG's 2011 SCS Preferred Land Use Scenario. Fehr & Peers incorporated the assumptions from those studies for use in this analysis to ensure that the modeling reflected the latest and most accurate land use and transportation network assumptions. For further detail on how the N-STDM was updated for this study, please refer to Appendix B.

Existing and future traffic volumes were used to assess corridor performance, though the focus of the analysis was on intersection operations, as these are the greatest sources of traffic bottlenecks along the corridor. Modeling outputs for all of the intersections along the corridor are included in Appendix C. Each of the output sheets includes a variety of metrics for the AM and PM peak hours and for each direction and turning movement; summary information (such as overall average delay and LOS) is at the bottom of each sheet.

Right of Way Mapping

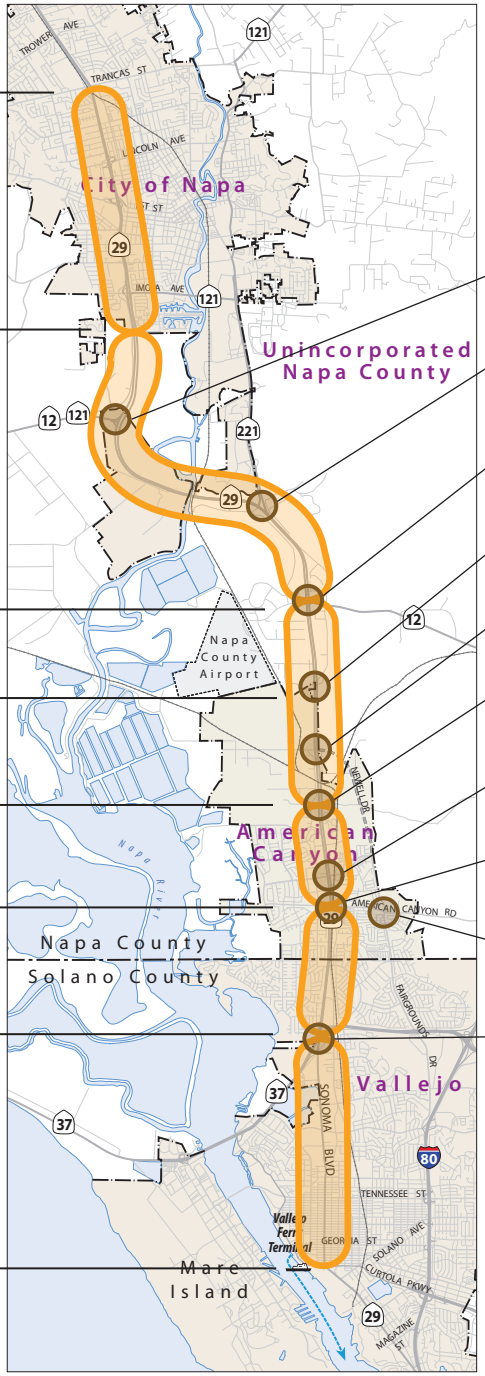
Caltrans provided their Right-of-Way Record Maps and available improvement plan documents covering the entire length of the Study Corridor. The maps range in age from over 70 years old to as recent as 2011, with the majority being last updated in the 1990s. While most are Right-of-Way Record Maps, there are improvement plans from 1943, updated last in 1973, from just south of Kimberly Drive in American Canyon to just north of Fagan Creek in Napa County, totaling approximately four miles. Additionally, some Right-of-Way Record Maps contain detailed information about improvements existing at the time of mapping.

Figure 4-1: Key Map



Intersections

- **I10** SR 29/SR 121/SR12 (Carneros)
- **I9** SR 29/SR 221 (Soscol)
- **I8** SR 29/Airport Boulevard/SR 12 (Jameson Canyon)
- **I7** SR 29/South Kelly Rd
- **I6** SR 29/Green Island Road
- **I5** SR 29/Napa Junction Road
- **I4** SR 29/Donaldson Way
- **I3** SR 29/American Canyon Road
- **I2** American Canyon Road at Newell Drive
- **I1** SR 29/SR37 Interchange



No significant roadway improvements proposed (4 lane freeway with median). **S6**

No significant roadway improvements proposed (4 lane rural highway with median). **S5**

Rural Highway Concept - 6 lanes with median. **S4-b**

Parkway Concept - 6 lanes with median and shared use paths. **S4-a**

OPTION 1: Boulevard Concept - 4 lanes with median plus frontage roads with Class II bicycle lanes.
OPTION 2 (*RECOMMENDED*): Modified Boulevard Concept - 6 lanes with median and Class I shared use paths. **S3**

OPTION 1 (*RECOMMENDED*): Parkway Concept - 4 lanes with medians and shared use paths.
OPTION 2: SB Parkway/NB Boulevard Concept - 4 lanes, northbound-only frontage road with Class II bicycle lane, and southbound-only Class I shared use path. **S2**

No significant roadway improvements proposed (4 lanes with median north of Valle Vista Avenue). **S1**

I10 Proposed channelization of northbound through movement and free right from SR 121/SR 12

I9 Two alternatives proposed: a partial and a fully grade-separated interchange. *Fully grade separated is recommended.*

I8 Two alternatives proposed: a "tight diamond" interchange and a Single-Point Urban Interchange. *Tight diamond is recommended.*

I7 Bicycle network transition zone: access via future Vine Trail alignment.

I6 No improvements proposed beyond lane widening.

I5 No improvements proposed beyond lane widening and potential signal synchronization.

I4 No improvements proposed beyond lane widening and potential signal synchronization. Additional improvements may be needed if Boulevard option is chosen.

I3 No improvements proposed beyond lane widening and potential signal synchronization.

I2 No improvements proposed beyond lane widening and potential signal synchronization.

I1 No improvements proposed beyond lane widening and potential signal synchronization.

IMPROVEMENTS BY SEGMENT AND INTERSECTION

This section describes the recommended improvements by roadway segment and major intersection. Each segment and intersection is demarcated in Figure 4-1, which provides a key map for the entire study corridor. Figure 4-2 illustrates all of the proposed improvements, summarizing the recommendations for the corridor. Each of these is described in more detail in the sections that follow. Improvements are described from south to north, beginning in the City of Vallejo and ending in the City of Napa.

Segment 1: South of SR 37 (Vallejo)

South of SR 37, where SR 29 is known as Sonoma Boulevard in the City of Vallejo, this study defers to the Sonoma Boulevard Specific Plan, which is underway. Figure 4-3 shows this section of the corridor. While the plan is not yet finalized or adopted, it is assumed that recommendations for the roadway corridor will be based on the Corridor Design Plan, which preceded the Specific Plan and outlined guiding principles, general goals and objectives for the corridor.

Transportation and urban design analysis completed for Sonoma Boulevard suggests that the roadway will not be widened in this section; rather, improvements to the corridor will focus on streetscape and enhancements to multimodal mobility.

Ultimately, the Sonoma Boulevard Specific Plan will also have its own implementation plan and financing strategy, thus this study does not include cost estimation or financing for this part of the corridor.

Segment 2: SR 29 from SR 37 to American Canyon Road (Vallejo and Southern American Canyon)

Current Conditions

SR 29 and SR 37 intersect at a grade-separated interchange (Intersection 1), with SR 37 providing access to Interstate 80 to the east and Marin County to the west. North of the interchange, SR 29 is a four-lane highway with an unlandscaped median. No sidewalks are provided, and while bicycles are permitted on the roadway, there are no striped bike lanes.

This segment of SR 29 currently sees between 2,000 and 3,000 vehicles in each direction during the peak hours on weekdays, resulting in a roadway LOS of F. At the same time, the interchange at Highways 37 and 29 (Intersection 1) performs at acceptable levels of service in the AM and PM peak hours (LOS A and B, respectively).

With the exception of the area around the SR 37 interchange, the right of way in this segment is 140 feet until Kimberly Drive. North of Kimberly Drive, there is some variation from 140 to 130 feet.

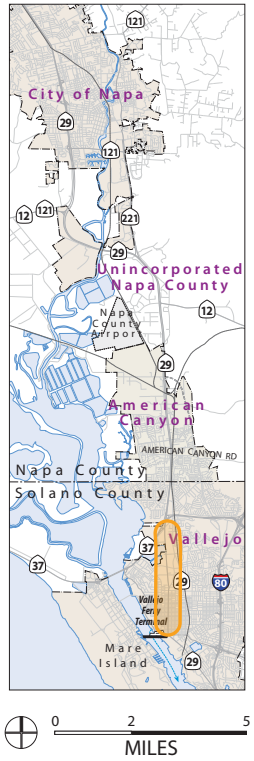
Alternatives Considered

Two options were considered for this segment, both of which are consistent with the Vision Plan and focus on improving multimodal accessibility and aesthetics of the roadway.

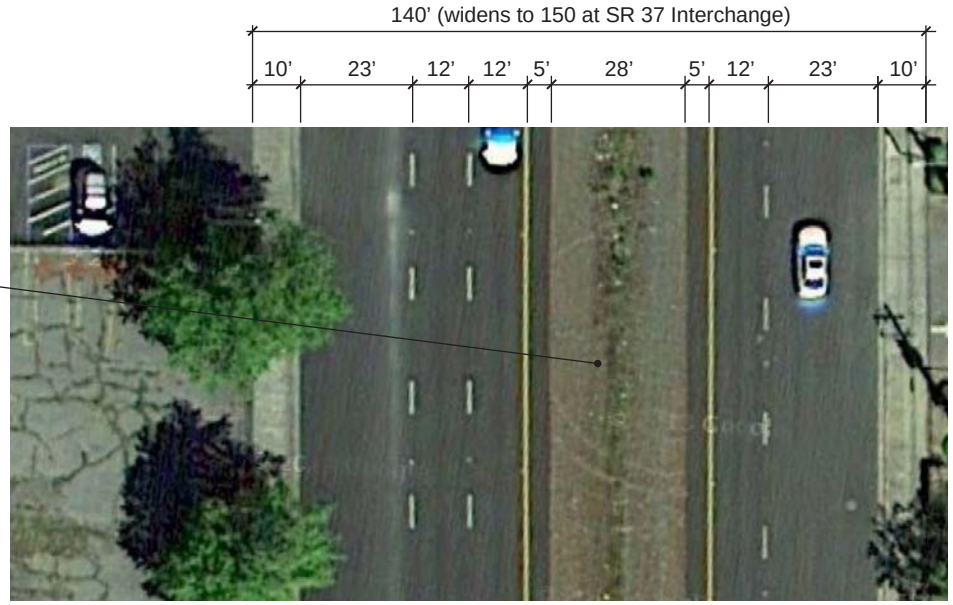
Option 1 envisions the roadway as a parkway, remaining at four lanes. A 12-foot wide Class I shared use path would be added on each side of the road, separated from the vehicle travel lanes by a planting strip. The planting strip and the central median would be landscaped with trees. Figure 4-4 shows existing and proposed conditions under Option 1, and Figure 4-5 shows a section diagram of Option 1.

Option 2 modifies the Parkway design such that in the northbound direction only, the roadway would be designed as a boulevard. One local access lane would be provided in addition to two through traffic lanes. In this direction, a Class II on-street bike lane and a sidewalk would replace the Class I shared use path. Figure 4-6 shows existing and proposed conditions under Option 2, and Figure 4-7 shows a section diagram of Option 2. Option 2 was proposed in order to provide better access to future development on the large vacant parcel on the east side of SR 29, bounded by SR 29, Mini Drive, Broadway Street, and the existing Food 4 Less grocery store. If development on this parcel were to be designed to face SR 29 and have a pedestrian orientation, the boulevard design of the roadway would better support this type of urban form.

S1 South of SR 37



0 2 5
MILES

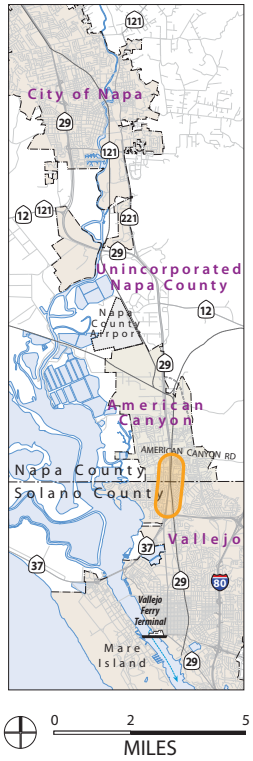


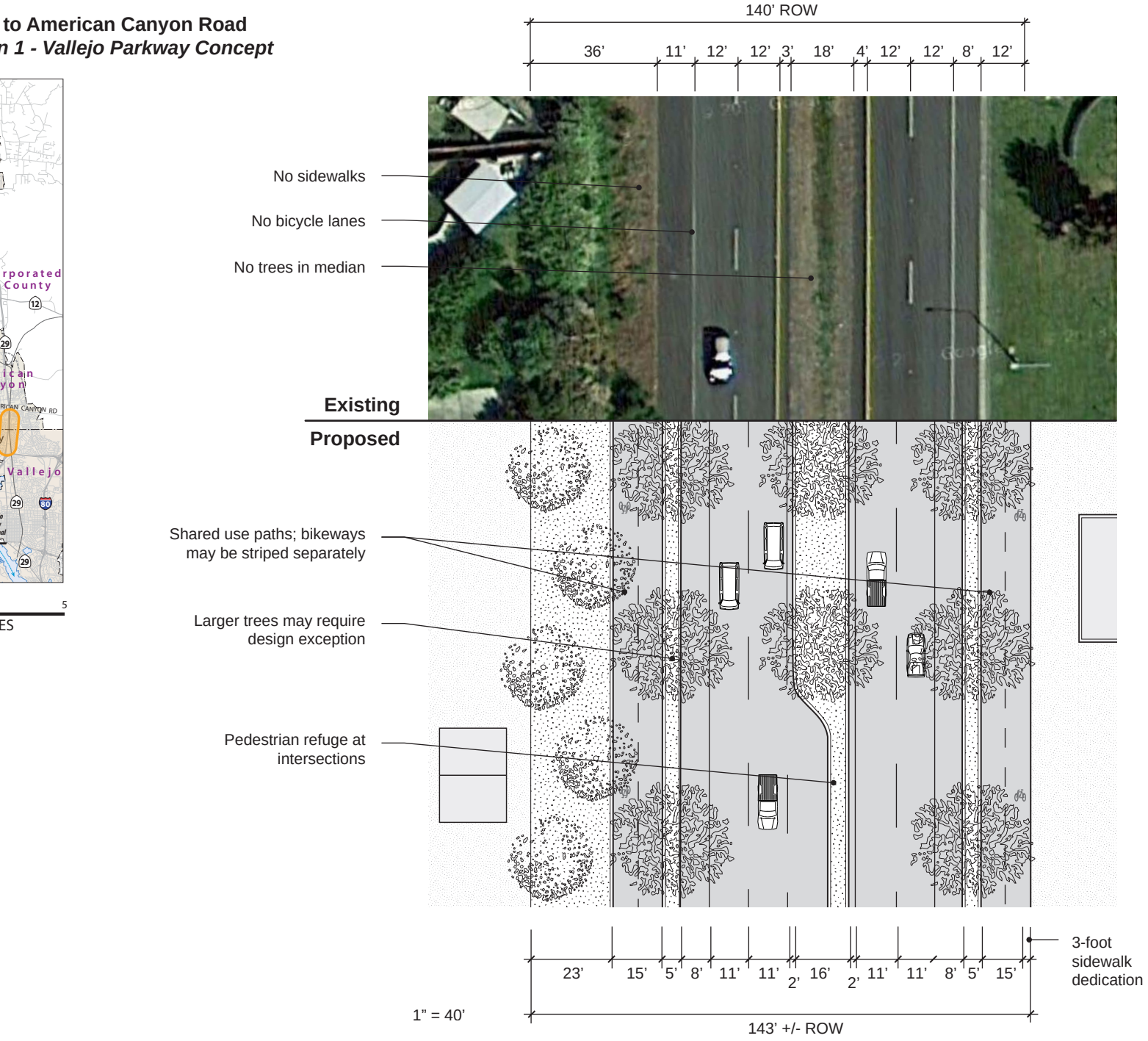
Existing Conditions

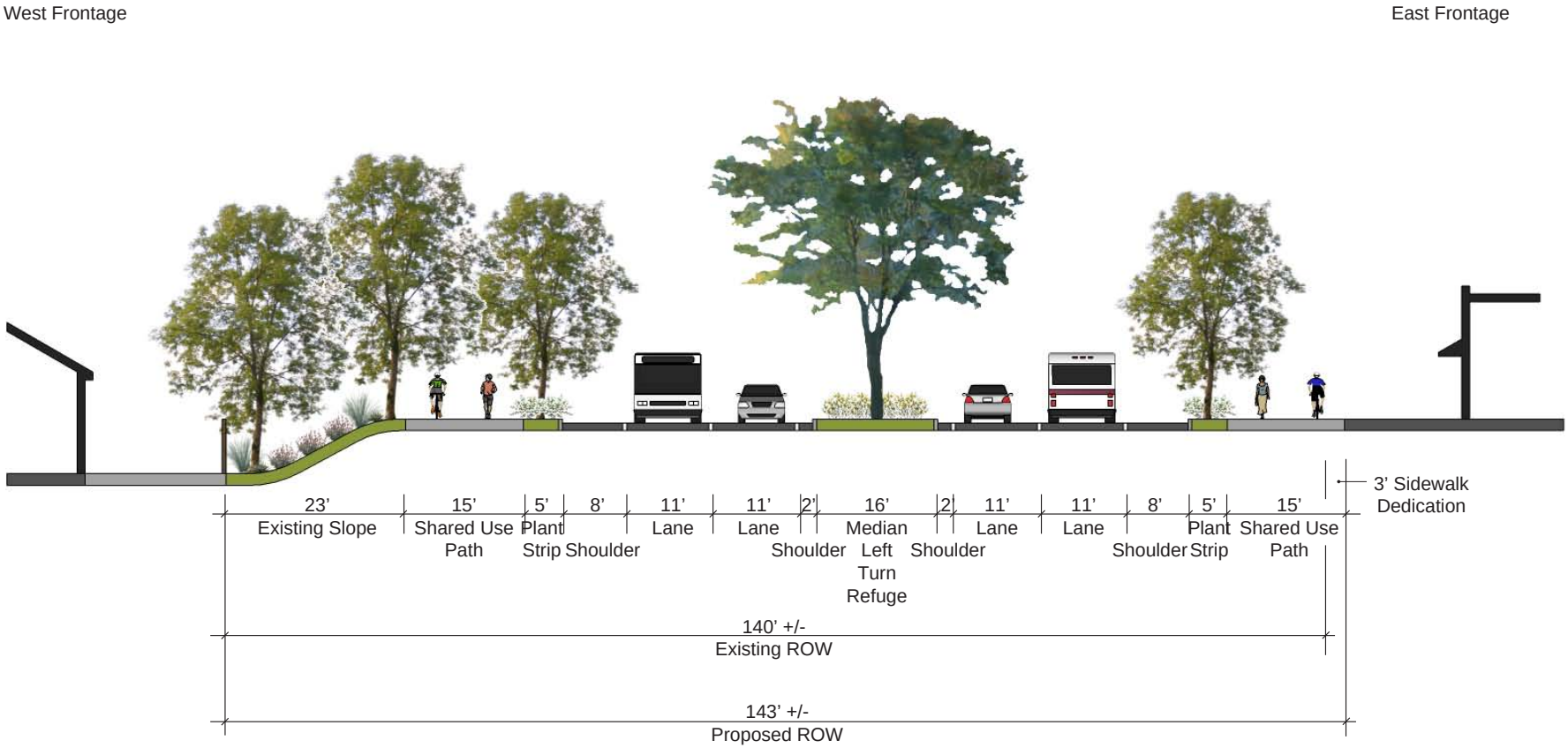
Future conditions defer to the Sonoma Boulevard Specific Plan; impovements will focus on streetscape and multi-modal improvements.

S2 SR 37 to American Canyon Road

Option 1 - Vallejo Parkway Concept





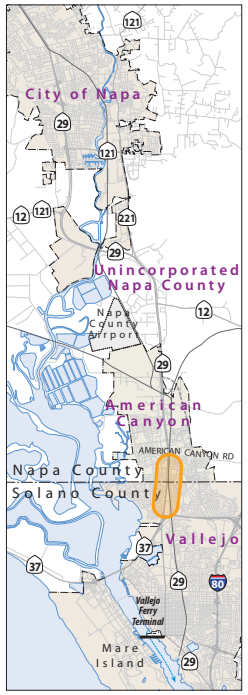


S2 SR 37 to American Canyon Road

Option 1 - Vallejo Parkway Concept

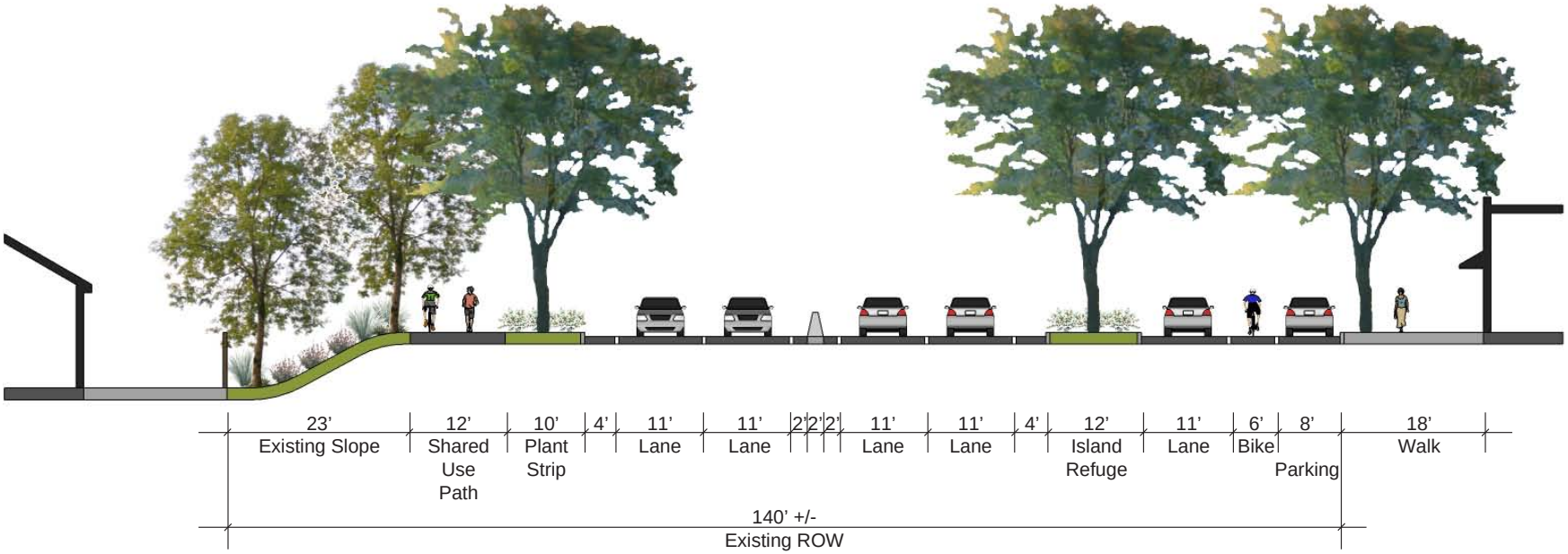
S2 SR 37 to American Canyon Road

Option 2 - Vallejo SB Parkway/NB Boulevard Concept



West Frontage

East Frontage



S2 SR 37 to American Canyon Road

Option 2 - Vallejo SB Parkway/NB Boulevard Concept

Proposed Improvements

Both Option 1 and Option 2 are carried forward as recommendations, with a preferred recommendation of Option 1 so as to be consistent with recommendations for the next segment north in American Canyon (Segment 3). Improvements for Option 1 and for the southbound direction in Option 2 consist of:

- Landscaping improvements (trees in compliance with Caltrans standards)
- Construction of planting strips
- Construction of Class I shared use paths

For Option 2 in the northbound direction, to create a boulevard, improvements consist of:

- Construction of a northbound local access lane, beginning with a slip lane north of SR 37 and ending at Mini Drive
- Striping of Class II bike lane on local access lane
- Construction of planting strip and sidewalk

No changes to intersection operations at SR 37 are proposed under either scenario.

Projected Operations and Performance Assessment

With improvements in place under either scenario, Intersection 1 is projected to continue to operate at an acceptable level of service (B) during both the AM and PM peak hours (Table 4-1).

Design Considerations and Physical/ Infrastructure Constraints

There are three existing culverts crossing the highway along this segment. It is assumed that the culverts can remain in place with potential extensions as necessary to accommodate the roadway widening. The modifications may require construction of 1,600 linear feet (LF) of retaining wall along the west side of the highway, north of Meadows Drive if re-grading the existing slope cannot mitigate the grade differentials.

TABLE 4-1: INTERSECTION 1 PERFORMANCE (SR 29/SR 37)

Scenario	AM LOS	PM LOS
Existing	A	B
Future (4 Lane)	B	B
Future (4 Lane w/NB Boulevard)	B	B

Source: Fehr & Peers, 2013

Segment 3: SR 29 between American Canyon Road and Napa Junction Road (Central American Canyon)

Current Conditions

SR 29 continues as a four-lane highway with an unlandscaped median into central American Canyon. Sidewalks are present in several short stretches on either side of the highway, but discontinuous. Cycling is permitted on the shoulder, but the shoulders are not formally signed or striped as bikeways. Frequent left turn pockets, right turn pockets, and merging areas occur at intersections and driveways to provide access to adjacent businesses and roadways.

This segment of SR 29 currently has between 2,500 and 3,500 vehicles in each direction during the peak hours on weekdays, resulting in a roadway LOS of F. The intersection of SR 29 and American Canyon Road (Intersection 3) performs at LOS E in the AM peak hour and LOS D in the PM peak hour. At SR 29 and Napa Junction Road (Intersection 5), the intersection performs at LOS D in the AM peak hour and LOS B in the PM peak hour. The intersection at Donaldson Way, halfway between American Canyon Road and Napa Junction Road (Intersection 4), performs at LOS C during both peak hours.

The right of way varies from 130 feet to 140 feet to Eucalyptus Drive. Just north of Eucalyptus Drive, the roadway begins widening until it reaches 350 feet at Napa Junction Road.

Alternatives Considered

SR 29 through central American Canyon represents the critical challenge of the Gateway Corridor Study: how to accommodate substantial (and increasing) automobile traffic while improving multimodal mobility and safety, particularly for residents of American Canyon. North of the American Canyon Road intersection, SR 29 will need to widen to six lanes to accommodate future automobile traffic. At the same time, improvements to bicycle and pedestrian travel are of critical importance to local residents who must travel along and across the highway for their daily trips to work, school, and other local destinations.

Two alternatives were analyzed as part of this study: the Boulevard and the Modified Boulevard. Both attempt to balance and address the competing demands of accommodating automobile traffic and improving conditions for other modes of travel. Both involve widening the roadway to six automobile travel lanes and making significant improvements to bicycle and pedestrian facilities, as well as improving landscaping and general roadway aesthetics.

BOULEVARD

The Boulevard would be designed similarly to the northern Vallejo segment described above. In each direction, two through lanes would be provided, aimed at commuter traffic traveling through American Canyon without the intention of stopping at local destinations. A central median landscaped with trees would separate the through lanes in each direction. No turns would be permitted from these lanes. On the outside of the through lanes, separated by a landscaped median, a slower-speed local access lane would provide access to adjacent businesses and neighborhoods. The local access lane would also have a striped Class II bike lane adjacent to the curb. Separated from the roadway by a planting strip, continuous sidewalks would also be provided. The sidewalk width is also wide enough to accommodate a Class I path. Both right and left turns would be permitted from the local access lane.

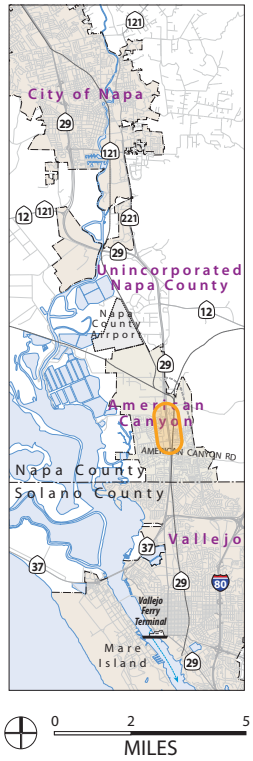
Figure 4-8 illustrates the existing conditions and the proposed Boulevard concept. Figure 4-9 shows the section view of the Boulevard concept. Total right of way required is 176 feet.

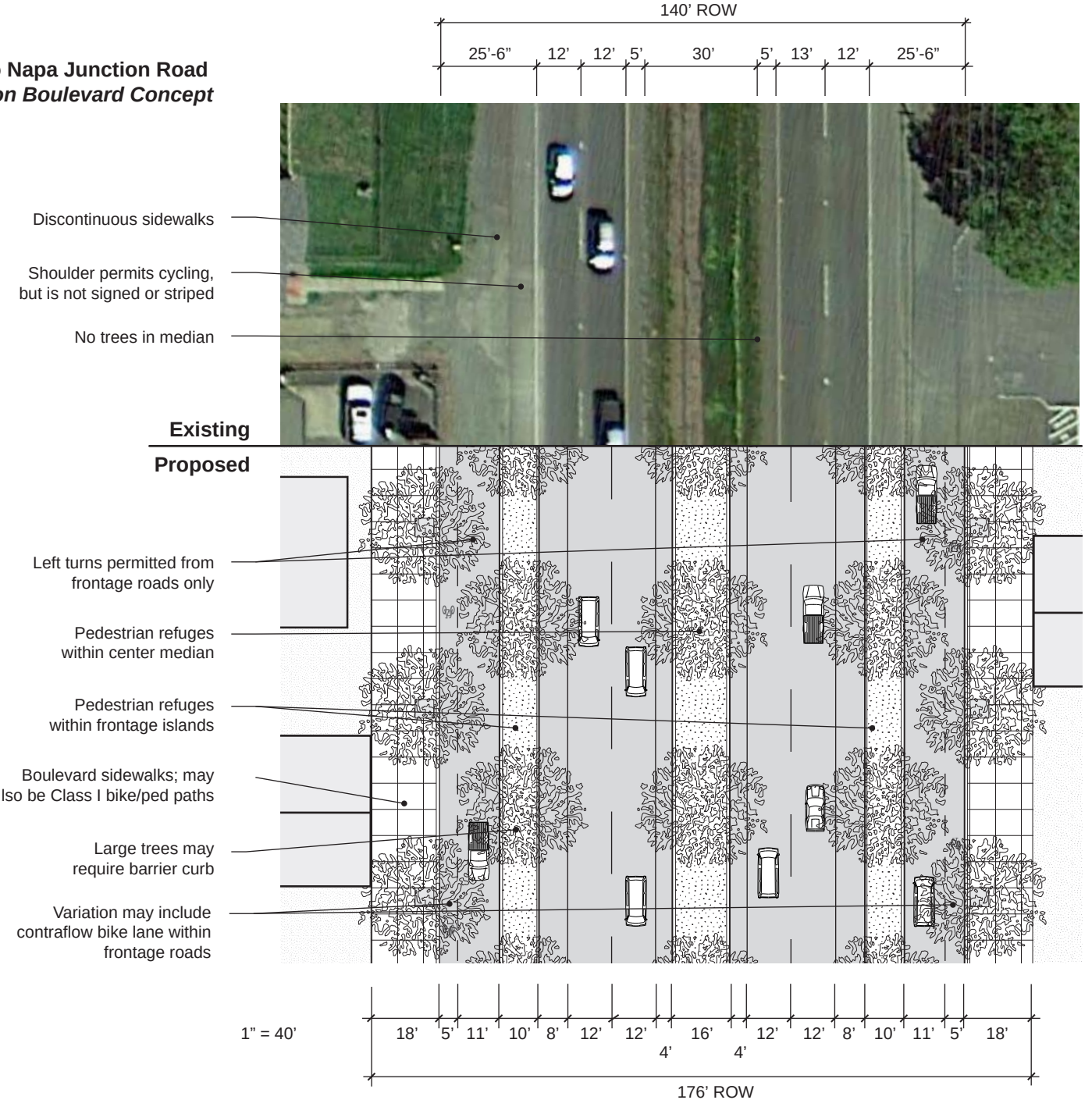
MODIFIED BOULEVARD

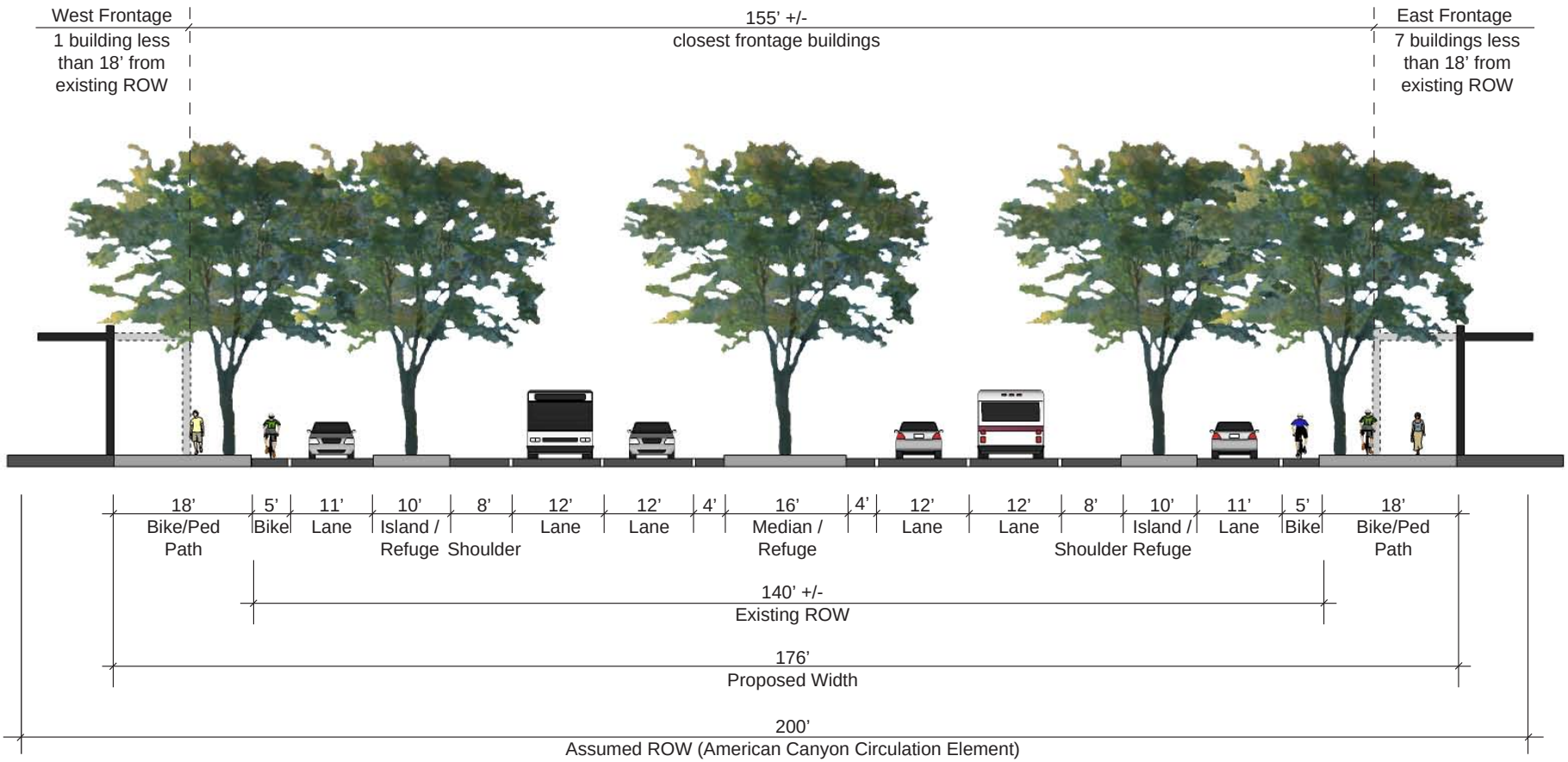
The Modified Boulevard would have six through lanes with regular turning movements permitted (a left turn pocket forming in the median at intersection approaches). A landscaped central median would be planted with trees per Caltrans standards. A Class I shared use path for bicycles and pedestrians would be provided on both sides of the highway, separated from the roadway with landscaped planter strips, also planted with trees. Figure 4-10 depicts the existing conditions and the Modified Boulevard concept, and Figures 4-11 and 4-12 show section and perspective views, respectively, illustrating how the concept would facilitate access and mobility for pedestrians, cyclists, and transit while providing six travel lanes for automobiles. A right

S3 American Canyon Road to Napa Junction Road

Option 1 - American Canyon Boulevard Concept







S3 American Canyon Road to Napa Junction Road

Option 1 - American Canyon Boulevard Concept

S3 American Canyon Road to Napa Junction Road

Option 2 - American Canyon Modified Boulevard Concept

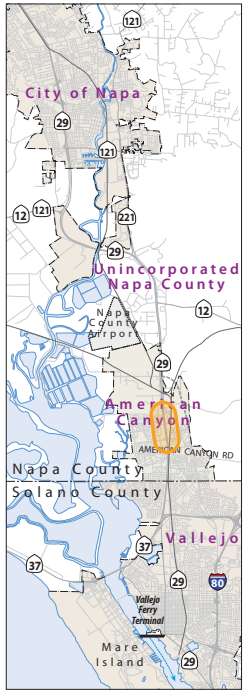
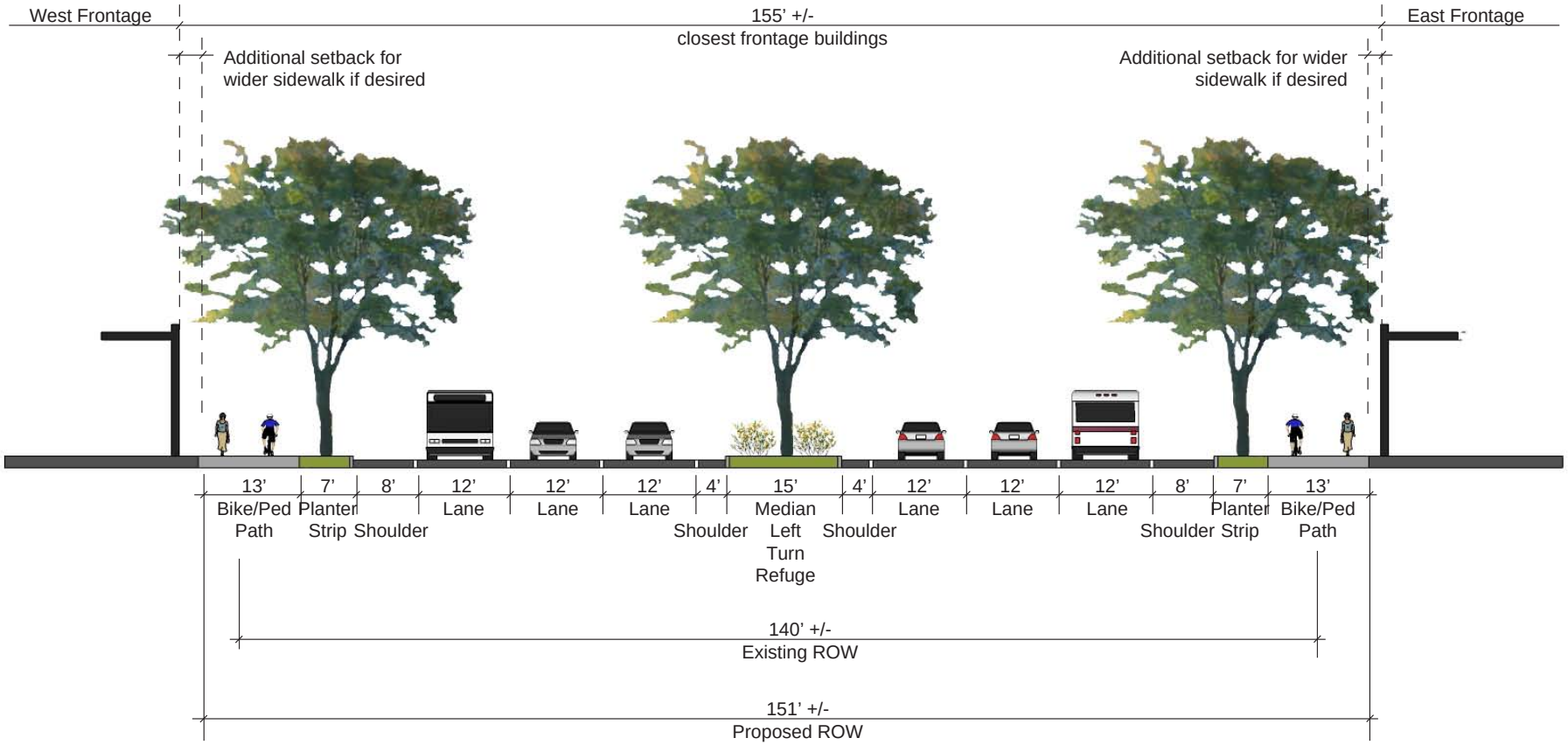


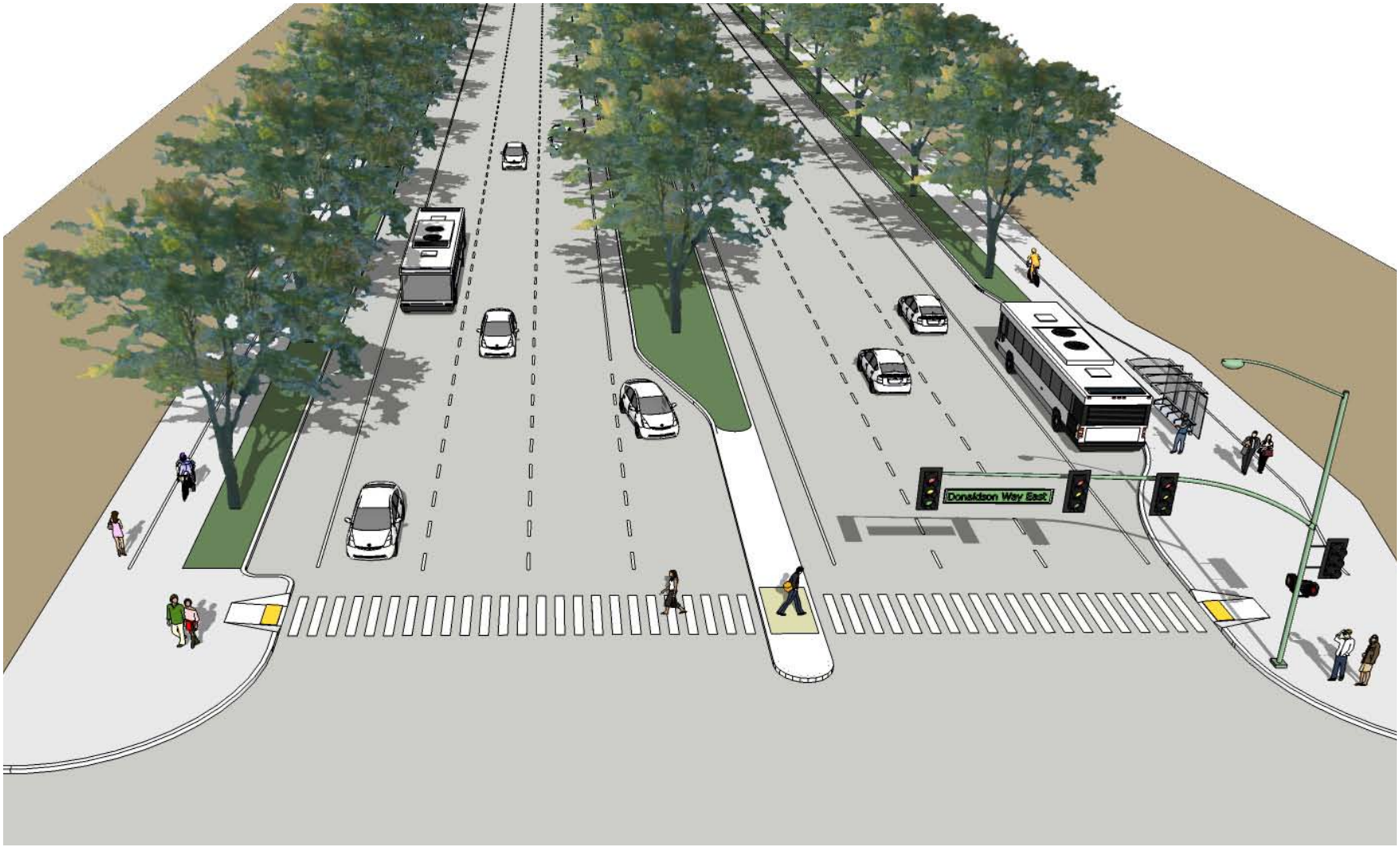
Figure 4-11: Proposed Section - Segment 3 Modified Boulevard Concept



S3 American Canyon Road to Napa Junction Road

Option 2 - American Canyon Modified Boulevard Concept

Figure 4-12: Perspective - Segment 3 Modified Boulevard Concept



S3 **American Canyon Road to Napa Junction Road**
Option 2 - American Canyon Modified Boulevard Concept

of way of 151 feet would generally be required along the roadway. A wider right-of-way would be necessary at intersections to facilitate left and right turning movements.

MICROSIMULATION ANALYSIS

While preliminary modeling of the Boulevard concept showed that it would improve traffic conditions to acceptable levels of service on the roadway between American Canyon Boulevard and Napa Junction Road and provide a desirable environment for pedestrians and cyclists, there remained concerns among the participating jurisdictions about certain aspects of the design: transitions between through and local access lanes, driver education, impacts on local businesses, impacts of turning movements on adjacent neighborhoods, and impacts to transit operations.

Designed to model regional travel, the N-STDM is not a fine-grained enough tool to accurately illustrate operations at the level of detail required to address these questions. To better understand how all modes of travel would perform under the two configurations, a microsimulation using Vissim traffic analysis software was performed, which showed detailed performance and traffic interactions at six intersections in American Canyon:

1. SR 29 / American Canyon Road
2. SR 29 / Donaldson Way
3. SR 29 / Poco Way / South Napa Junction Road
4. SR 29 / Rio Del Mar
5. SR 29 / Eucalyptus Drive
6. SR 29 / Napa Junction Road

The design options were analyzed using the Vissim (version 6) traffic microsimulation software. The analysis uses models of vehicle performance and driver behavior to model the interaction of agents (cars, bicycles, pedestrians, etc.), roadways, and traffic control. The software outputs various performance measures including throughput (volume served), delay, speed, and travel time. The software uses random seed values to generate vehicle entry time and vehicle characteristics. The results are an average of ten runs with different random seeds. Using the intersection delay results, the intersection LOS was assigned.

RESULTS

The Modified Boulevard option has three through lanes in each direction at the study intersections. With the higher capacity, this option is able to serve nearly all of the cumulative year PM peak hour traffic demand during the peak hour. This option can also accommodate potential Bus Rapid Corridor and/or HOV operations in the future. This would not be possible with the Boulevard option.

The Boulevard option, which has two through lanes, would only serve about three-fourths of the peak hour demand volume during the peak hour. As a result, the total delay measured in the analysis area for the Boulevard option is more than double the delay for the Modified Boulevard option. Table 4-2 summarizes the network performance of the two design options.

The network-wide average speed and number of stops show similar results: the Boulevard option has less than half the average speed and more than twice the number of stops as the Modified Boulevard option. Travel time between Kimberly Drive (south of American Canyon Road)

TABLE 4-2: AMERICAN CANYON NETWORK PERFORMANCE

Performance Measure	Modified Boulevard	Boulevard
Percent Demand Volume Served	99%	76%
Total Delay[1] (All Traffic)	386 hours	896 hours
Total Delay[1] (Non-motorized)	8 hours	10 hours
Average Speed for Motorized Traffic	22.8 mph	10.9 mph
Number of Stops for Motorized Traffic	19,711 stops	42,220 stops
Travel Time and Speed (Northbound)	5.8 minutes, 26.0 mph	7.3 minutes, 20.8 mph
Travel Time and Speed (Southbound)	6.3 minutes, 24.2 mph	11.2 minutes, 13.5 mph

1. Delay to vehicles queued outside of the network (for example, north of South Kelly Road) is not measured.

2. Travel time and speed are measured for vehicles traveling from Kimberly Drive to Green Island Road.

Source: Fehr & Peers, 2014

and Green Island Road (north of Napa Junction Road) is 1.5 minutes faster in the northbound direction and nearly five minutes faster in the southbound direction for the Modified Boulevard option.

Table 4-3 shows the intersection level of service (LOS) and average delay for the signalized intersections. The study intersections would operate at one LOS grade better under the Modified Boulevard compared to the Boulevard option. The fewer through lanes and higher signal cycle length in the Boulevard option provide lower corridor capacity. The lower capacity causes the higher average delays.

In the Boulevard option, the southbound queue at Napa Junction Road extends outside the model network boundary at South Kelley Road, which is about 5,000 feet north. For the Modified Boulevard option, the average maximum queue length for the southbound approach is 3,275 feet, which is less than the distance to Green Island Road (3,700 feet).

Proposed Improvements

This study recommends the Modified Boulevard design described in the alternatives section above. Improvements needed to implement the Modified Boulevard concept consist of:

- Right of way acquisition
- Construction of a third automobile travel lane in each direction
- Construction of Class I shared use paths
- Landscaping improvements to median (trees in compliance with Caltrans standards)
- Improved pedestrian crossings (refuges at medians, striping, and potentially different pavement or painting)
- Construction of planting strips

Safe and enhanced pedestrian crossings—especially, for example, near American Canyon Road, where schools are located east of the SR 29, and residential uses to the west—must also be provided. The City of American Canyon's recently adopted Circulation Element proposes three pedestrian overpasses across SR 29, and participants in the outreach process for this Plan would like to see at least one overpass as well, as contemplated in the city's Circulation Element. Because of the required height clearances for vehicles, any such overpass(es) will result in pedestrians negotiating considerably longer distances and expending additional energy going up and down, which may diminish use of the overpasses, as well as create safety issues if pedestrians continue to cross SR 29 at grade. Thus, the desirability (and cost) of the overpasses should be weighed against improved pedestrian crosses at grade, with sidewalk bulbouts and refuges at medians. This evaluation is beyond the scope of this Improvement Plan, and should be taken as part of the next stages of finalization of improvements, and in American Canyon's forthcoming Specific Plan for the corridor.

TABLE 4-3: AMERICAN CANYON INTERSECTIONS PERFORMANCE

	Modified Boulevard		Boulevard	
Intersection	**LOS**	**Delay**	**LOS**	**Delay**
American Canyon Road	E	61	F	181
Donaldson Way	C	28	D	45
Poco Way / South Napa Junction Road	C	29	D	39
Eucalyptus Drive	E	58	F	95
Napa Junction Road	E	66	F	201
Note: Average Delay is reported in seconds per vehicle.				

Source: Fehr & Peers, 2014

Projected Operations/Performance Assessment

The transportation analysis of cumulative year PM peak hour conditions shows that the Modified Boulevard option out-performs the Boulevard option with regard to motorized vehicle operations. The Modified Boulevard option has a higher throughput, lower total delay, and lower travel times on SR 29.

Although the Boulevard option would have higher non-motorized delay due to the longer cycle lengths, the level of pedestrian and bicycling comfort would likely be higher. The Boulevard option's cross section has multiple medians so that pedestrians crossing SR 29 would have less exposure to vehicle traffic. The north-south pedestrian phases at Eucalyptus Drive, Poco Way/South Napa Junction Road, and Donaldson Way would not have conflicting traffic since the phases are concurrent with the SR 29 mainline (for the Modified Boulevard option, northbound and southbound right-turning vehicles must yield to pedestrians and bicycles). Also, the frontage roads provide a barrier to the higher speed traffic on mainline lanes, which would improve comfort for pedestrians and bicyclists traveling along SR 29.

Vehicle performance for the Boulevard option could be improved with additional project features. For example, providing three through lanes for the mainline would provide additional capacity. Alternately, grade separation of the mainline lanes at the local street intersections would also increase through capacity for SR 29. These additional features may require additional right-of-way and would have higher construction cost (particularly for the grade separations).

Design Considerations and Physical/ Infrastructure Constraints

The roadway median along this segment of the Study Corridor widens, with the ROW maintaining a width of 140 feet. The available records for this segment originate in 1943, although they have updates as recently as 1973. Given the age of the record documents, items of potential concern may not still be relevant.

The record documents indicate that there were Joint Use Access (JUA) easements in the past with both railroad companies and PG&E. While there are no longer rail lines in use here, it is not known whether the tracks were removed or buried and whether the former JUA easements and adjoining ROW are still in place or have since been quitclaimed. There are overhead utility lines at two crossings just north of American Canyon Road. Additionally, a six-inch high-pressure gas line identified on the plans could still potentially be in use by PG&E.

There is one existing culvert crossing within Segment 3. It is assumed that the culvert can remain in place with potential extension improvements as necessary to accommodate the roadway improvements for the Modified Boulevard design. It is not anticipated that retaining walls will be required along this segment in order to implement the Modified Boulevard.

Segment 4: SR 29 from Napa Junction Road to Jameson Canyon Road/Airport Boulevard (Northern American Canyon and Napa County)

Current Conditions

North of Napa Junction Road, through the northern portion of the City of American Canyon and on into unincorporated Napa County, SR 29 is a four-lane highway with a median (landscaped with grass only). There are no pedestrian facilities. Wide shoulders permit cycling, but these are not formally signed or striped bike lanes.

This segment of SR 29 currently has daily vehicle volumes between 3,400 and 3,700 during the peak hours, resulting in a roadway LOS of E in the northbound direction and E/F southbound. The intersection of SR 29 and South Kelly Road (Intersection 7) performs at LOS C in the AM peak hour and LOS B in the PM peak hour. At the intersection of SR 29 and Jameson Canyon (SR 12)/Airport Boulevard, the intersection performs at LOS D in both peak hours.

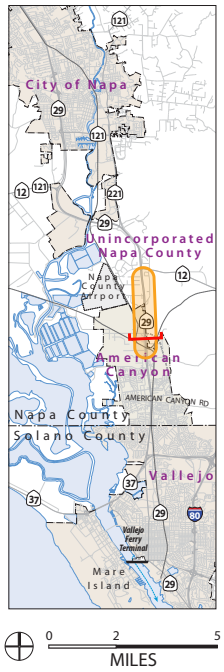
Immediately to the north of Napa Junction Road, the SR 29 right of way reduces to 215 feet, but then begins widening again to about 325 feet approaching the overpass of the railroad tracks. North of Green Island Road, the ROW becomes a consistent 128' until about 60 feet south of the intersection with South Kelly Road. South of South Kelly Road, the ROW becomes 167 feet wide consistently until SR 12.

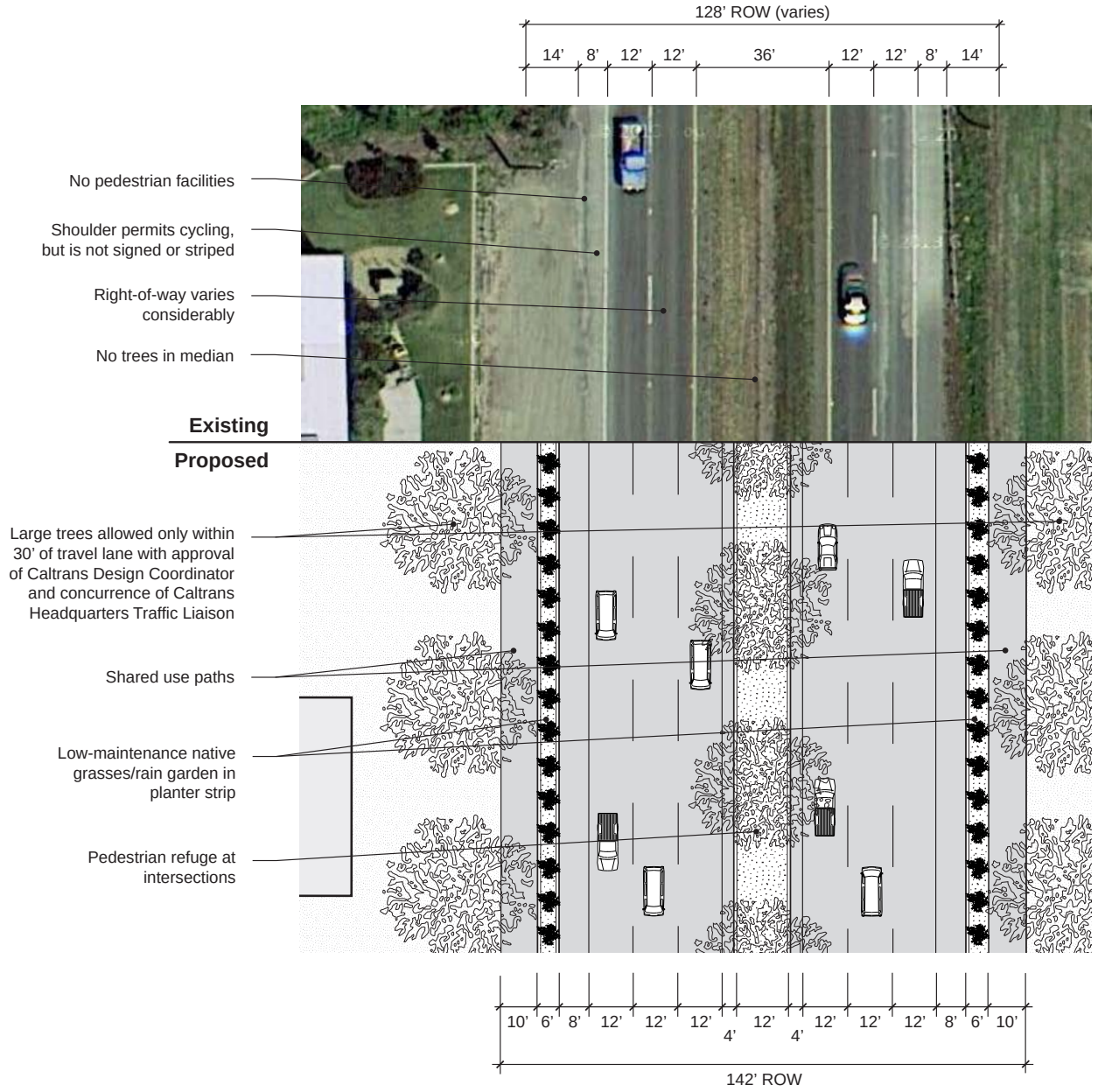
Alternatives Considered

Community members and participating jurisdictions expressed general agreement for this section of the roadway based on the Vision Plan, emphasizing improving traffic, accommodating bicycles and pedestrians where it was safe and logical to do so, and making aesthetic improvements. No major alternatives for the roadway

Figure 4-13: Existing and Proposed Conditions - Segment 4 Parkway Concept (Napa Junction Road to South Kelly Road)

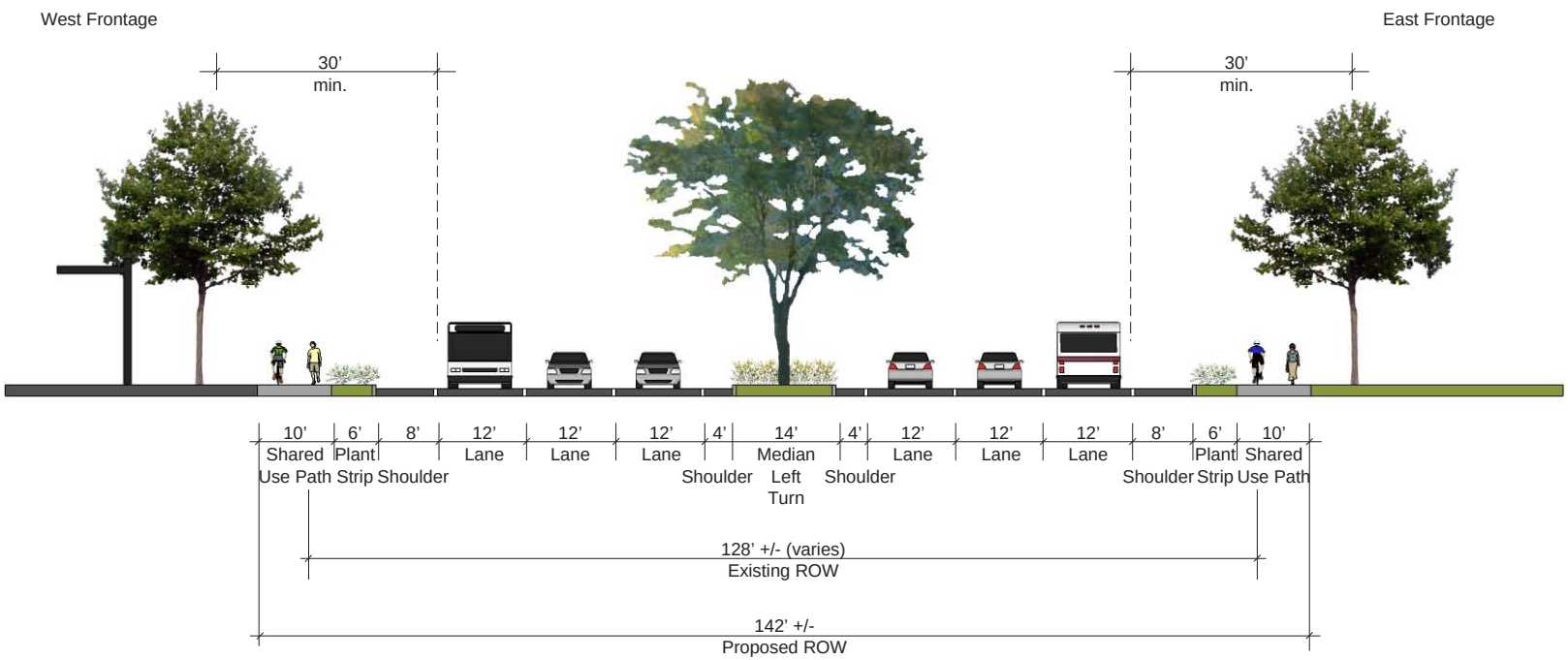
S4-a Napa Junction Road to South Kelly Road





1" = 40'

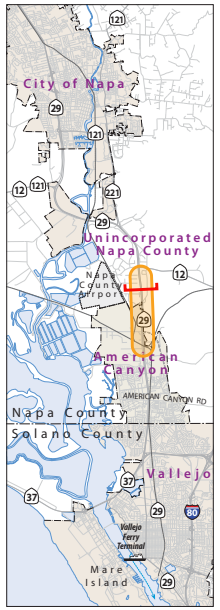
Figure 4-14: Proposed Section - Segment 4 Parkway Concept (Napa Junction Road to South Kelly Road)

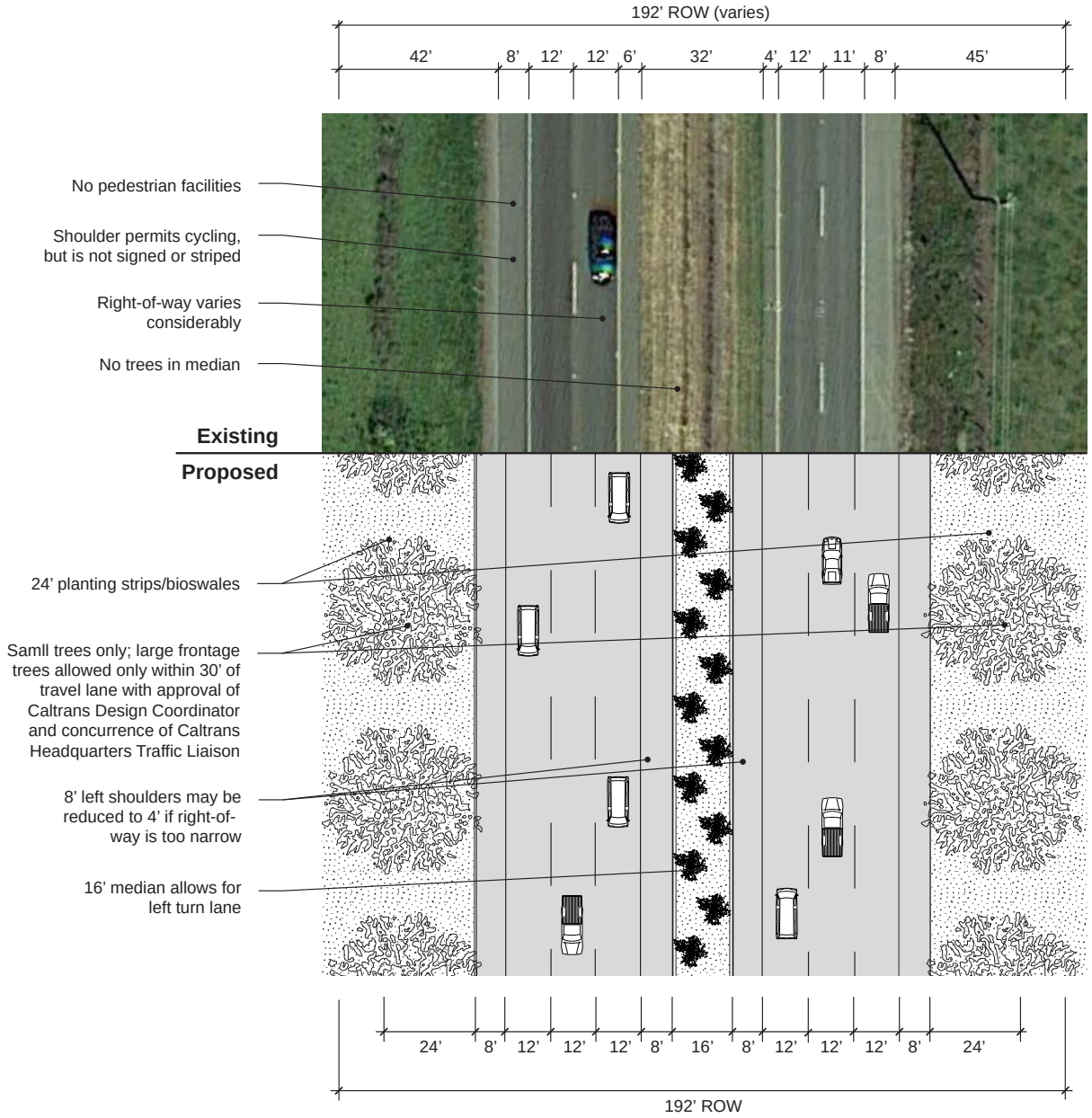


S4-a **Napa Junction Road to South Kelly Road**

Figure 4-15: Existing and Proposed Conditions - Segment 4 Rural Highway Concept (South Kelly Road to Jameson Canyon Road)

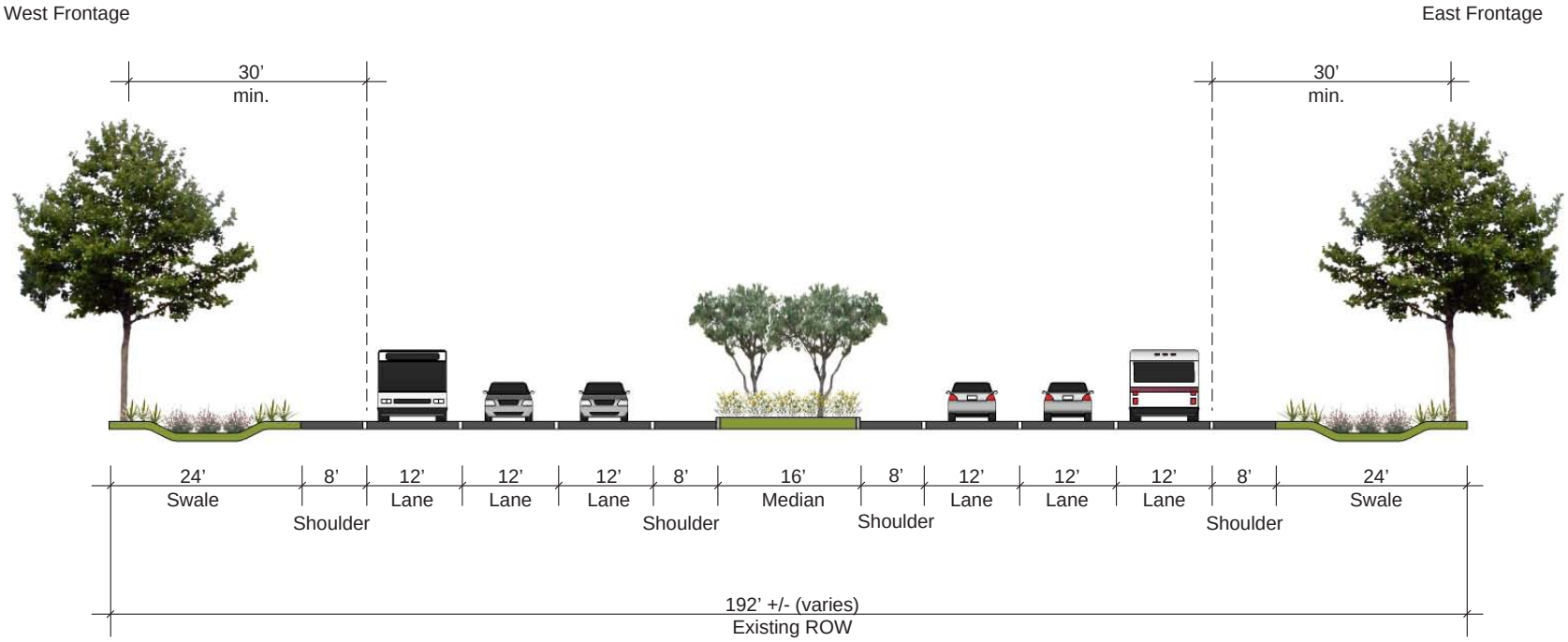
S4-b South Kelly Road to SR 12/Jameson Canyon Road





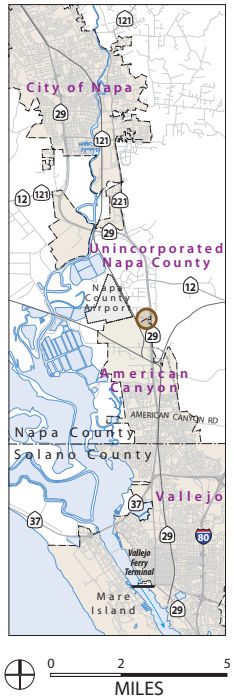
1" = 40'

Figure 4-16: Proposed Segment - Segment 4 Rural Highway Concept (South Kelly Road to Jameson Canyon Road)



S4-b **South Kelly Road to Highway 12/Jameson Canyon**

Figure 4-17: Bicycle Connections at South Kelly Road



I 7 Bicycle Access North of American Canyon

segment were modeled, beyond the future No Project (maintaining four lanes) and future six lanes.

Different alternatives were considered and modeled for Intersection 8 (SR 29 and Jameson Canyon/SR 12); these are discussed in more detail in the next section.

Proposed Improvements

In this segment, SR 29 should be widened to six lanes to accommodate future traffic, while also making improvements to bike and pedestrian travel. The proposed configuration is six through lanes, with eight-foot outside shoulders and four-foot inside shoulders adjacent to the median. The central median and planting strips should be landscaped with trees. Refer to Figures 4-13 and 4-14 for plan and section diagram of this segment. While the roadway cross-section may need to narrow in places due to constraints such as bridges; pedestrian and bicycle facilities should be preserved.

From South Kelly Road to Jameson Canyon Road, SR 29 remains at six through lanes, with eight-foot inside and outside shoulders wherever feasible. See Figures 4-15 and 4-16 for illustrations of this segment.

A 12-foot Class I shared use path should be provided on each side of the roadway from Napa Junction Road to South Kelly Road. At this point, primary bicycle access is provided via other adjacent facilities. To the east, bicycle access is provided via South Kelly Road, which bends north and connects to Jameson Canyon Road. To the west and north along the remainder of the Study Corridor, bicycle access is provided via the connection to Devlin Road, which is the future alignment of the Vine Trail. Figure 4-17 illustrates the bicycle network at this transition zone. If an underpass can be constructed at South Kelly Road, the Vine Trail may shift its alignment to cross SR 29 here instead of via the Paoli Loop. While the Class I shared use path is discontinued north of South Kelly Road, bicycle use is still permitted on the shoulder.

Projected Operations/Performance Assessment

The six-lane roadway configuration will improve level of service at the intersection at South Kelly Road (Intersection 7) to acceptable conditions (Table 4-4). Future operations of the Jameson Canyon intersection are discussed in the next section.

Design Considerations and Physical/ Infrastructure Constraints

Implementing the proposed roadway improvements for the southern portion of this segment may be constrained by the Southern Pacific Railroad highway overpass (the Lombard Crossing). Each direction of the overpass is approximately 40 feet wide and could accommodate the three lanes of traffic with reduced shoulders. Significant modifications to the existing roadway overpass or construction of a separate pedestrian/bicycle overpass would be necessary in order to link the shared bike and pedestrian improvements proposed to the north and south of the railroad. Both the north and south approaches to the overpass would require a minimum 20 feet widening to accommodate the new shared paths. It is not clear at this time whether re-grading of the existing highway embankment slopes will be sufficient to accommodate the extra width or if retaining structures would also be required. For this reason, alternatives to providing Class I paths on both sides of the highway in this portion of the segment should be considered, as long as bicycle access along the roadway is maintained in some form.

At the northern end of this segment, the PG&E JUA (Joint Utility Easement) documented in the records may have active utilities`.

Fagan Creek crosses under SR 29 less than one mile south of SR 12. In addition, a large existing storm culvert crosses the roadway just north of Fagan Creek. With the wider medians along

TABLE 4-4: INTERSECTION 7 PERFORMANCE (SR 29/SOUTH KELLY ROAD)

Scenario	AM LOS	PM LOS
Existing	C	B
Future No Project (4 Lanes)	F	F
Future (6 Lanes)	C	C

Source: Fehr & Peers, 2013

Figure 4-18: Tight Diamond Interchange Design - Intersection 8

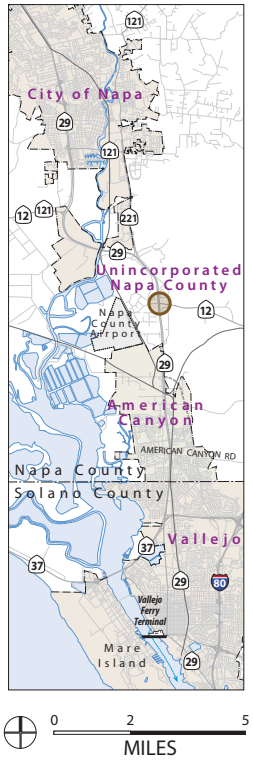


Figure 4-19: Single Point Urban Interchange (SPUI) Design - Intersection 8

this entire stretch of highway, there appear to be various sized drainage culverts along and across the roadway. It is assumed that no major modification will be required for these, other than possible extension of the existing lines.

Intersection 8: Jameson Canyon Road/ Airport Boulevard

Current Conditions

The intersection of SR 29 with Jameson Canyon Road/SR 12 (to the east) and Airport Boulevard (to the west) is currently an at-grade, signalized intersection (Intersection 8). Free/unsignalized right turns are allowed from every approach. Southbound on SR 29 and eastbound on Airport Boulevard, there are two left turn lanes. Other approaches have one left turn lane. The intersection currently performs at LOS D in both peak hours, with average delays of 44 to 46 seconds.

At SR 12, there is an octagonal-shaped right-of-way to encompass the intersection. The octagon is about 600 feet long aligned with SR 29 and about 650 feet at its widest where SR 12 crosses.

Alternatives Considered

The future design for the Jameson Canyon intersection is characterized in Caltrans' current plans as a standard "tight diamond" interchange, with free-flowing northbound and southbound movements on SR 29, a westbound on-ramp to northbound SR 29, an eastbound on-ramp to southbound SR 29, and two signals where the off-ramps intersect Jameson Canyon Road. While this configuration would improve to LOS C in the AM peak hour, LOS in the PM peak hour is projected to decline to LOS E given the future volumes of traffic predicted.

Stakeholders in this study desired to test an alternative interchange design known as a Single-Point Urban Interchange (SPUI), which would eliminate one of two signals required by the tight diamond interchange, potentially reducing delay and improving LOS. Generally speaking, there are several broad advantages and disadvantages of a SPUI over other interchange types should be taken into consideration. Advantages include a single controller (traffic signal), which makes for simpler phasing and potentially easier synchronization with other signals; and increased capacity. Disadvantages include a wider crossing distance and consequently longer signal phases; potentially higher construction costs due to a larger bridge deck; and potentially more complex pedestrian crossings on the cross street.

TABLE 4-5: INTERSECTION 8 FUTURE PEAK HOUR LOS AND DELAY (SR 29/JAMESON CANYON)

Peak Hour	Diamond Weighted Average Delay	SPUI Average Delay
AM	C, 25 seconds	D, 46 seconds
PM	E, 62 seconds	F, 94 seconds

Source: Fehr & Peers, 2013

Figures 4-18 and 4-19 illustrate conceptual designs of the two options tested.

An additional option discussed amongst the committee members is a "teardrop roundabout", which will require additional modeling and study. Preliminary order-of-magnitude cost estimates for this design are included in Appendix D.

ANALYSIS

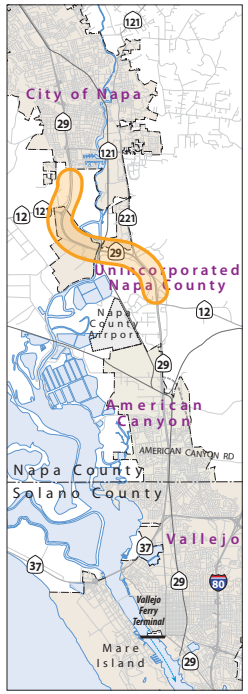
In order to make an "apples-to-apples" comparison between the diamond interchange and the Single Point Urban Interchange (SPUI), Fehr & Peers took the weighted average delay of the two diamond intersections to develop the average delay of both intersections together (to compare the average to the one intersection of the SPUI). Note that this is a rough estimate of the average delay, as it does not take into account the weighted delay by movement.

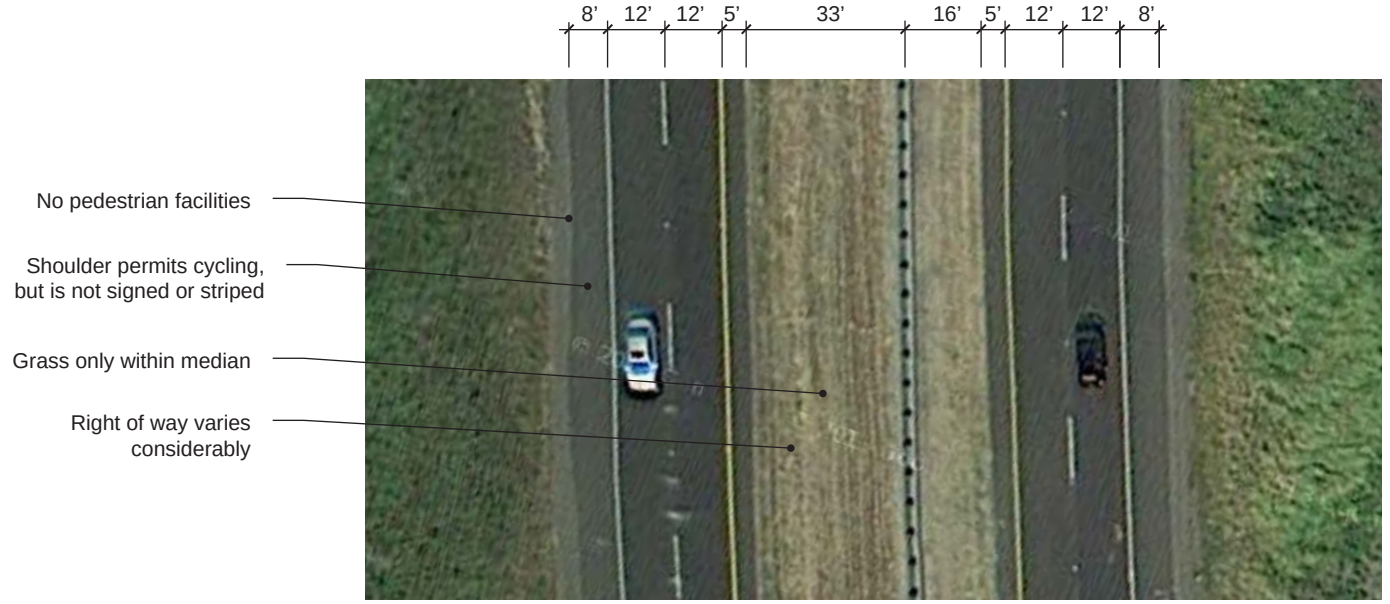
RESULTS

The SPUI performs similar to the diamond interchange, even though it is configured with longer yellow and all-red signal phase times (due to longer intersection crossing distances) (Table 4-5).

For the AM case, performance is slightly worse overall likely due to the distribution of trips. The southbound left movement is the heaviest. This movement is counted twice (once for each intersection): a heavily delayed southbound left on the western intersection, and an eastbound through movement on the eastern intersection

S5 Highway 12/Jameson Canyon to Urbanized City of Napa





1” = 40’

Existing Conditions

The existing four lanes will remain sufficient to handle future demand. Improvements to highway will be limited to landscaping and signange in the median and along frontages, with major improvements at intersections only.

with very little delay (due to light volume for the conflicting movement).

For the PM case, SPUI performance continues to be worse than the tight diamond interchange. Southbound left is still the heaviest movement, but volumes that conflict with the southbound left are also heavier (compared to the AM). This limits the green time for southbound lefts for the SPUI. While this green time limitation also occurs at the western intersection of the diamond interchange, those vehicles continue through at the eastern intersection with little delay, reducing the average delay.

Proposed Improvements

Based on the results of the alternatives testing, and weighing advantages and disadvantages, the proposed improvement for the Jameson Canyon intersection is the tight diamond interchange. Northbound and southbound SR 29 would experience free-flow. The westbound on-ramp to northbound SR 29 and the eastbound on-ramp to southbound SR 29 would also experience free-flow. Airport Boulevard/Jameson Canyon would bridge over the highway, with signals at off-ramps and at Jameson Canyon Road/Airport Boulevard.

This interchange will also serve as the transition point for SR 29 from six lanes (south of the intersection) to four lanes (north of the intersection). Northbound, this is accomplished by having the third through lane becoming a trap exit lane to Jameson Canyon Road. Southbound, this is accomplished by having the entrance lane from Airport Boulevard remain as a travel lane south of the interchange.

TABLE 4-6: INTERSECTION 8 PERFORMANCE AS TIGHT DIAMOND (SR 29/JAMESON CANYON)

Scenario	AM LOS	PM LOS
Existing	E	D
Future (Full Interchange)	C/C*	F/A*
*LOS shown for SB/NB ramp intersections only		

Source: Fehr & Peers, 2013

Projected Operations/Performance Assessment

Table 4-6 shows projected operations for the interchange in the tight diamond configuration. LOS is only shown for the southbound/northbound ramp intersections only; in other words, movement in the east/west direction is not averaged in. Southbound and northbound ramps would perform at LOS C in the AM peak hour, and LOS F (southbound) and A (northbound) in the PM peak hour

Segment 5: SR 29 North of Jameson Canyon Road (Napa County)

Current Conditions

North of Intersection 8, SR 29 currently continues as a four-lane rural highway with a median, landscaped with grass only. There are no pedestrian facilities. Wide shoulders permit cycling, but these are not formally demarcated for bicycle use. Figure 4-20 shows existing conditions.

The segment of SR 29 between Jameson Canyon Road and SR 221 currently sees the highest vehicle volumes of the entire corridor, from 4,200 northbound to nearly 5,000 southbound during the AM peak hour and over 5,000 northbound during the PM peak hour. These volumes translate to a roadway level of service of F in both directions. Between SR 221 and SR 121 (the Carneros intersection), volumes decrease as traffic splits between SR 29 and SR 221 towards Downtown Napa. Roadway level of service for this segment varies from D to F.

North of Intersection 8, the right of way is 192 feet then varies around the curve to the west prior to the junction at SR 221 from about 200 to 300 feet or more. Continuing past SR 221, the right of way increases significantly to 700 feet or more in parts; vehicle travel lanes and shoulders account for approximately 84 feet of this width. The median varies from zero to about 50 feet. Most of this right of way width encompasses ground slopes as SR 29 rises to pass over Napa Valley Corporate Drive and then the Napa River.

At the river crossing, there is another railroad crossing of Union Pacific Railroad tracks and the right of way narrows just at the tracks to 95 feet, which is assumed to encompass the single span of four lanes crossing the tracks and river. The road continues along an elevated span west of the Napa River in a 265-foot right of way path, crossing over Stanley Lane before widening again on-grade to about 550 feet. The right of way width varies around the curve back to the north, but is never less than 330 feet, and

widens significantly, 600 to 700 feet or more, at the junction with Highways 12 and 121. Approaching the urbanized limits of the City of Napa, the right of way begins to narrow down to 220 feet at the first residences south of Napa.

Currently cyclists are prohibited from accessing the SR 29 bridge over the Napa River. Future solutions that will permit extending a Class II bike lane over the bridge to provide access for skilled cyclists may involve raising the railings on the bridge.

Alternatives Considered

Similar to the segment between Napa Junction Road and Jameson Canyon Road, there was general agreement amongst the community and stakeholders about the desired future character of the roadway through this section of the corridor. SR 29 should remain a rural highway, with some enhanced landscaping, signage, and bike facilities where appropriate. Assessment of alternatives in this segment focused around the intersections—Intersection 9, SR 221 (Soscol) and Intersection 10, SR 121 (Carneros)—which are each discussed separately in subsequent sections.

Proposed Improvements

North of the Jameson Canyon intersection, four lanes remain sufficient to support travel demand in the future, provided that improvements to the major intersections are also implemented, including adequate transition lanes. Therefore, apart from the intersections, improvements to the corridor are limited to improving landscaping and signage in median and along the frontage. Bicycles are permitted on the roadway until it becomes a limited access freeway (north of Carneros), but it is anticipated that the Vine Trail—which will run parallel to the corridor, but not immediately adjacent to it—will be the primary bicycle route in this segment. An alternative route along North and South Kelly Roads, on the east side of the corridor, provides another opportunity for bicycle access and Class II bike lane development.

Projected Operations/Performance Assessment

Modeling shows that retaining a four-lane configuration is sufficient to support future traffic volumes; improvements to level of service will depend almost entirely on improvements made to the three major intersections in unincorporated Napa County (Jameson Canyon, Soscol, and Carneros), which are discussed separately.

Design Considerations and Physical/ Infrastructure Constraints

Much of this segment of the Study Corridor is elevated above the surrounding terrain, crossing smaller roadways, railroad tracks, and the Napa River. Soscol Creek crosses SR 29 south of SR 221. Currently, bicycles are not allowed on the bridge; extending access to cyclists on this segment of the highway, potentially through providing higher railings, is critical for providing continuous access for this mode of travel. In addition to the large Napa River bridge crossing, there are also various drainage and creek crossing improvements west of the Napa River surrounding the Highways 121 and 12 junction.

The PG&E JUA easement that is documented in the records to the south appears to terminate just north of SR 12. Another JUA benefits the Napa Water Company and AT&T in the same vicinity. South of the Highways 121 and 12 junction, there is an overhead utility crossing. At the far north end of this segment, just before urbanized Napa, another JUA benefitted PG&E, however available documents do not indicate whether the easement is recorded.

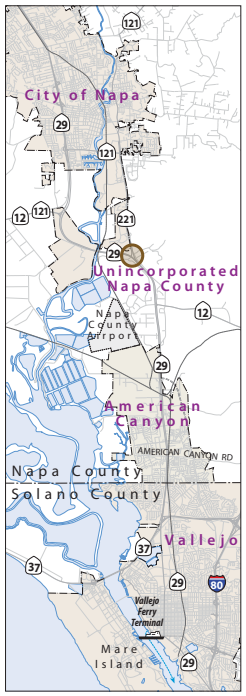
Intersection 9: SR 29/SR 221 (Soscol)

Current Conditions

Intersection 9, of SR 29 with SR 221 (Soscol), is currently at-grade and signalized, with a free-flow configuration from northbound SR 29 to northbound SR 221. High traffic volumes on this segment of SR 29—exacerbated by commuters entering the roadway from Jameson Canyon Road to the south—cause the intersection to perform at level of service F in both the AM and the PM peak hours.

Rendering of proposed Soscol flyover

Figure 4-21: Partial Grade-Separated Interchange Design - Intersection 9



4/12/2011 1:25:30 PM

Figure 4-22: Full Grade-Separated Interchange Design - Intersection 9

Alternatives Considered

Caltrans has studied potential improvements to this intersection and is currently completing a Draft EIR that studies two alternatives: a partial and a fully grade-separated interchange. The partial grade-separated solution would involve a flyover in the southbound direction only, allowing southbound traffic on SR 221 to continue free-flow traffic onto southbound SR 29. The traffic signal for other turning movements would be left in place. The fully grade-separated interchange would eliminate the traffic signal and construct a single-lane connector ramp for southbound Soscol traffic to flow onto northbound SR 29, with movement onto Soscol Ferry Road restricted to right-in/right-out only. Figures 4-21 and 4-22 depict the two alternative designs.

Modeling of these two alternatives shows that the partial grade-separated design does not improve intersection operations, whereas the full interchange design improves level of service to A (Table 4-7).

TABLE 4-7: INTERSECTION 9 PERFORMANCE (SR 29/ SR 221)

Scenario	AM LOS	PM LOS
Existing	F	F
Future (Flyover Only)	F	F
Future (Full Interchange)	A	A

Source: Fehr & Peers, 2013

Proposed Improvements

This study recommends the full interchange configuration for the SR 29/SR 221 (Soscol) intersection, which is consistent with Caltrans' preference.

Projected Operations/Performance Assessment

As shown in Table 4-7, the full interchange would perform at LOS A, thereby also improving roadway level of service on SR 29 north and south of the intersection, and on SR 221 north of the intersection. The LOS values stated in the table represent an average of the northbound and southbound ramp intersections.

Design Considerations and Physical/ Infrastructure Constraints

The EIR for this project has not been finalized; preliminary impacts include a possible visual impact of the elevated structure on the "grape crusher" statue, which lies just northwest of the current intersection and is seen as an aesthetic resource and a key gateway element to the Napa Valley.

TABLE 4-8: INTERSECTION 10 PERFORMANCE (SR 29/SR 12/SR 121)

Scenario	AM LOS	PM LOS
Existing	D	D
Future No Project (4 Lanes)	F	F

Source: Fehr & Peers, 2013

Intersection 10: SR 29/SR 12/SR 121 (Carneros)

Current Conditions

The northernmost major intersection in the rural highway section of the corridor is that of SR 12/121/29, also known as the Carneros intersection (Intersection 10). Carneros is an at-grade, signalized intersection that performs at LOS D under current conditions. Vehicle volumes east and west on SR 121 during the AM and PM peak hours are around 1,700 in each direction, creating a roadway level of service of F.

Alternatives Considered

Fehr & Peers' initial modeling of future conditions at this intersection showed it performing at LOS F in its current configuration (Table 4-8). At this time, Caltrans has no accepted or adopted improvement strategy (as part of a route concept report or project study report, for example) for the intersection that would significantly improve LOS, e.g. a grade-separated interchange. Caltrans did produce a Project Study Report in 2006 that examined options for a flyover, but these were not carried forward.

Stakeholders for this study expressed interest in testing several concepts for the intersection with the potential to improve performance without needing a grade-separated solution: a roundabout (signalized and unsignalized) and channelization of turning movements. The results are discussed below.

ROUNDABOUT

Fehr & Peers first tested a roundabout, where the conflicting movements are:

- Northbound left (NBL)
- Southbound thru (SBT)
- Eastbound left (EBL)

Free movements are:

- Northbound thru (NBT) (bypass)
- Southbound right (SBR) (free right; currently right turn on red)
- Eastbound right (EBR) (free right)

The HCM 2010 analysis for roundabouts showed a significant amount of delay and queuing for the SBT and EBL movements. The three-legged configuration of this intersection allows for the NBL movement to enter the roundabout without conflict. However, the high volume of this movement impedes entry of the SBT and EBL movements into the roundabout. A roundabout with more than two approach lanes would require simulation analysis, which Fehr & Peers did not undertake.

Since analysis of a roundabout with more than two approach lanes was not performed, this option is not ruled out. Caltrans requires that roundabouts, as well as other types of controls, be evaluated for intersection modifications.

CHANNELIZATION

Signalized roundabouts are most effective when there are more than four approaches and the departure movements are somewhat random. By contrast, at the Carneros intersection, a signalized roundabout would not operate differently than a standard intersection due to the low number of conflicting movements and discrete departure for each approach. The roundabout would, however, require ROW acquisition; therefore Fehr & Peers did not pursue this solution further.

Instead, the modeling effort focused on modifying the existing intersection with channelization of the northbound through movement and reintroduction of the free right, similar to the roundabout configuration described above. There appears to be room on the SR29 ROW median to include two receiving lanes for the EBL movement, and have it merge with the mainline after reaching highway speeds (Figure 4-23).

The NBT free movement was modeled in Synchro by changing the NBT movement into a free NBR movement. The intersection was tested for sensitivity to the downstream merge of the NBT and EBL movements; it did not affect analysis of the intersection itself. Level of service results indicate that the intersection would operate at LOS F under future conditions. However, as Table 4-8 below shows, while the intersection remains at LOS F, average delay is significantly decreased—by approximately 86 seconds in the AM and 74 seconds in the PM—compared to the no build condition.

Taking out the NBT green phase allows the signal timing to be optimized just to the three conflicting movements (EBL, SBT, & NBL). While this configuration shows improvement, these three movements would continue to operate at LOS F.

CONCLUSION

The roundabout (signalized and unsignalized) does not perform better than the baseline future condition. A channelization solution, in which the northbound thru movement on SR 29 moved freely and the eastbound left movement on SR 12 merged via a slip lane into the northbound direction, still performs at LOS F in both peak hours (Table 4-9). However, the average delay in this configuration is reduced by over 60 seconds, indicating some improvement. In order to appreciably improve LOS at this intersection, grade separation would be required. However, as with all interchange designs, this would have adverse effects on alternative modes of travel, would require right of way acquisition, have potentially greater environmental impacts, and require significantly greater funding.

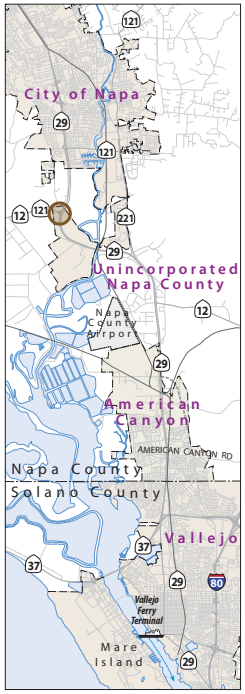
TABLE 4-9: ALTERNATIVE FUTURE PEAK HOUR LOS AND DELAY, CARNEROS INTERSECTION

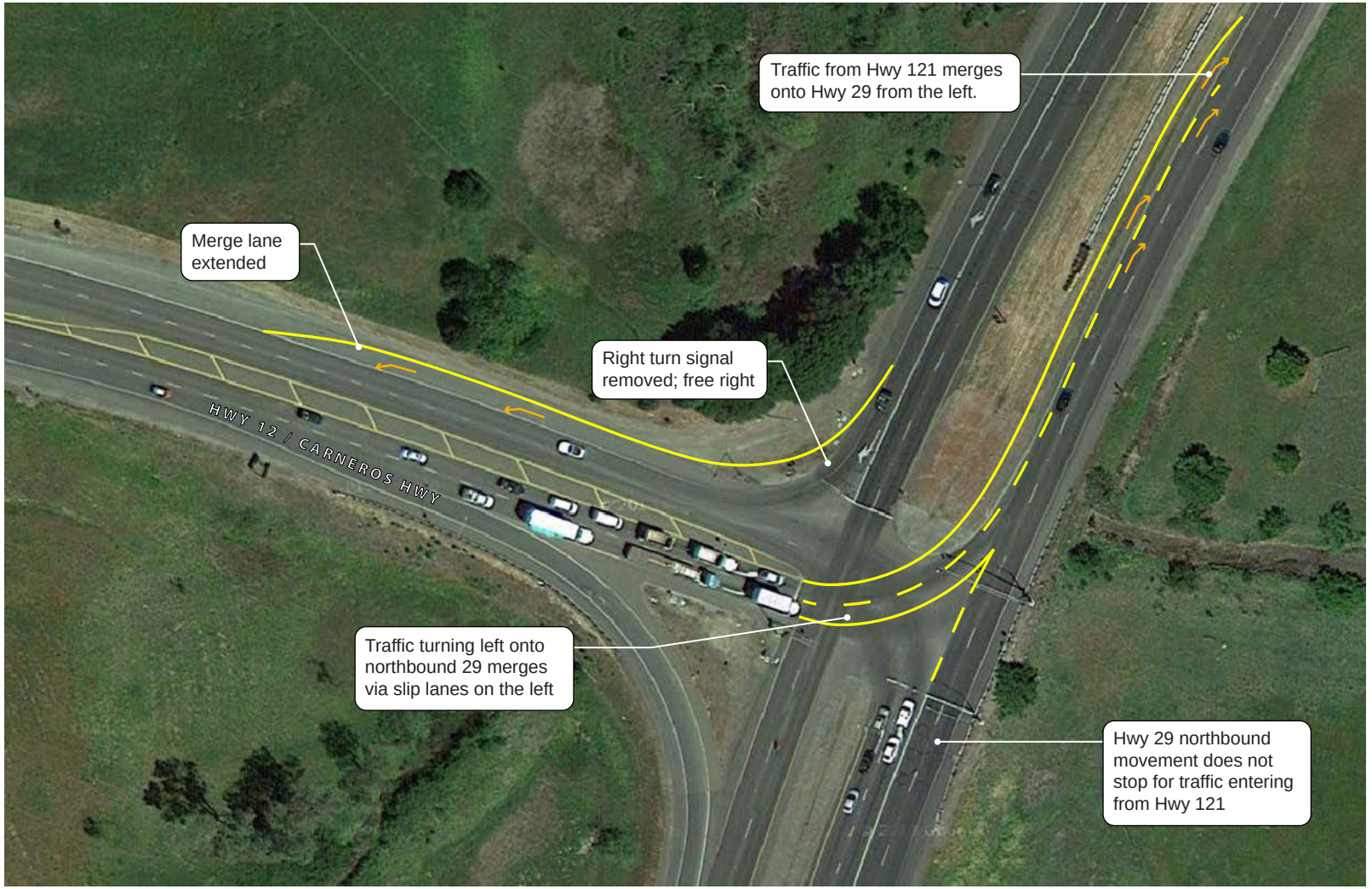
Peak Hour	Cumulative Configuration (4 lanes highway)	Free Passby Configuration (4 lane highway)
AM	F, 204 avg delay	F, 119 avg delay
PM	F, 161 avg delay	F, 87 avg delay

Source: Fehr & Peers, 2013

Figure 4-23: Channelization Design - Intersection 10

I10 SR 29/SR 121/SR 12 (Carneros)





1" = 100'

Proposed Improvements

This study recommends the channelization solution described in the alternatives section above. The primary improvements would be:

- Signal reconfiguration: northbound through movement on SR 29 moves freely, does not stop at light
- Construction of slip lane: eastbound left on SR 121 merges via a slip lane into northbound SR 29
- Signal reconfiguration: create free southbound right from SR 29

Projected Operations/Performance Assessment

Performance for the recommended improvement is discussed in the conclusion section of the Alternatives discussion, above.

Segment 6: Urbanized City of Napa

Current Conditions

The last, northernmost segment of SR 29 is a limited access freeway as the roadway enters the urbanized City of Napa. It continues with two lanes in each direction, and an occasional third lane for merging at regular freeway on and off ramps. Cycling is prohibited. Landscaping is increased, with small trees, large bushes and shrubs taking the place of grass in the median and along the shoulders in both directions. Sound walls separate the freeway from adjacent development. See Figure 4-24.

The freeway segment of SR 29 performs at acceptable levels of service, ranging from B to C between the Carneros intersection and the southern city limits (with volumes ranging from around 1,600 to 2,600) to LOS D in central Napa (with volumes ranging from 2,500 to 3,500) during the AM and PM weekday peak hours.

Through the City of Napa to the northern limits of the Study Corridor, the right of way limits vary as SR 29 passes through various sized regular freeway intersections. There is one segment of about one half mile that is 130 feet, but the rest of the right of way is 150 feet or more for the remainder of the corridor.

Alternatives Considered

The community and project stakeholders generally agreed that this section should remain an urban freeway. No alternative roadway configurations were tested.

Proposed Improvements

Recommended improvements related to this study are limited to aesthetic and wayfinding treatments for this section of the corridor. Major operational improvements in the City of Napa are limited to those outlined in the 2011 update to the City of Napa General Plan.

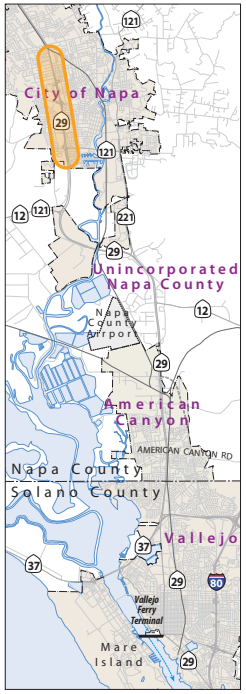
Projected Operations/Performance Assessment

Projected operations are at acceptable levels without further intervention.

Design Considerations and Physical/ Infrastructure Constraints

Existing development along this corridor frontage would be major constraint to any future widening of the roadway. In addition, a major drainage crossing of the Napa Creek occurs north of 1st Street. An at-grade railroad crossing also constrains the corridor just before the Redwood Road on/off ramps.

S6 Freeway in Urbanized City of Napa



0 2 5
MILES

13' 9' 12' 12' 5' 24' 5' 11' 14' 10'

Cycling prohibited

Median landscaped with small trees and shrubs

Right of way varies considerably

1" = 40'

Existing Conditions

No significant roadway improvements planned beyond those already put forward by the City of Napa. Improvements to highway will be limited to landscaping and signage.

ACTIVE TRANSPORTATION

Fostering active, or human-powered, transportation—walking and bicycling—is a critical component of the plan for the SR 29 corridor. Active transportation has many benefits: it promotes health and wellness; reduces the number of trips by private automobile, thus also reducing air pollution and greenhouse gas emissions; and contributes to a vital and livable urban environment. The reduction in greenhouse gas emissions associated with shifting travel modes towards active transportation directly contributes to achieving statewide goals for addressing climate change, as set forth in AB 32 and SB 375. Providing for active transportation is also an important goal of California's Complete Streets legislation, which requires cities and counties to plan for transportation systems that support safe and convenient mobility and access for all modes of travel, including bicycles, pedestrians, and transit.

While the improvements proposed for the segments and intersections in this chapter include descriptions of facilities for pedestrians and cyclists, this section summarizes the entire pedestrian and bicycle network along the corridor in order to provide a broader characterization of the whole system.

Bicycle Access and Mobility

Bicycle facilities along SR 29 are enhanced throughout the corridor. Specific new facilities for bicycles and pedestrians—Class I shared use paths, within the highway right of way but separated from the automobile travel lanes by and landscape strip—are proposed for the segment from SR 37 to American Canyon Road, and from Napa Junction Road to South Kelly Road. Between American Canyon Road and Napa Junction Road, two options are being proposed: a Boulevard concept that would include Class II bike lanes along the local access lanes, and a Modified Boulevard concept that would continue the Class I design through the center of the city. Class I paths could also be accommodated in the Boulevard concept. In either case, new, dedicated facilities would be provided for cyclists, immediately adjacent to the road, providing convenient access to adjacent businesses and neighborhoods.

South of SR 37, access for cyclists to Downtown Vallejo and the ferry terminal would be provided along Sonoma Boulevard (with specific facilities designated by the Sonoma Boulevard Specific Plan). Additional Class I facilities between the ferry terminal and the SR 29/SR 37 intersection will be provided as part of the Vine Trail route, along the south side of the SR 37 causeway and then down Harbor Drive to the ferry terminal.

North of South Kelly Road, cyclists have two choices: they may continue on SR 29 directly, on the eight-foot shoulder that would be provided in each direction, or they may access the Vine Trail via Airport Boulevard to Devlin Road. Refer to Figure 4-15 for an illustration of this transition. It is also recommended that the highway shoulders be striped as Class

Increasing safety, convenience, and accessibility of active transportation modes along SR 29 is a high priority of community members.

Class I multi-use paths are safest and most conducive to use by recreational walkers and bicyclists.

II bike lanes wherever feasible, consistent with the Napa County Bicycle Master Plan and the American Canyon Circulation Element.

The Vine Trail is a planned Class I bicycle/pedestrian path that will connect the City of Napa to the Vallejo Ferry Terminal, recommended by the Napa County Bicycle Plan (2012), to provide a safe and continuous facility for cyclists traveling between these destinations for commuting and recreation purposes. The Vine Trail will generally follow the SR 29 corridor, but will not occupy any of the right of way. In some instances, it will lie to the east, and in others, to the west, depending on available right of way, connectivity, and appropriateness of the roadways.

The Vine Trail is likely to be the route of choice for recreational cyclists and many commuters; however, some bicycle commuters may still prefer traveling along SR 29 itself, as it is the most direct path from north to south. Wherever the roadway is not a limited access freeway, cyclists will continue to be allowed to travel on the road itself (in an eight-foot shoulder, signed to ensure that access is clear). It is also recommended that the highway shoulders be striped as Class II bike lanes wherever feasible, consistent with the Napa County Bicycle Master Plan and the American Canyon Circulation Element. It is anticipated that this option will appeal only to serious commuters who are comfortable cycling adjacent to fast-moving automobile traffic.

Pedestrian Access and Mobility

Improvements to pedestrian mobility on the SR 29 corridor emphasize increased safety, convenience, and comfort in areas closest to neighborhoods and local destinations, such as shops and schools. Current conditions for pedestrians in the study corridor are at best, discontinuous, and at worst, unsafe. Ameliorating these conditions is a particularly high priority in central American Canyon, where SR 29 bisects the community and creates a significant physical barrier to residents' and visitors' ability to travel safely on foot.

The American Canyon community expressed a desire to improve pedestrian access and safety, and the city's recently updated Circulation Element also includes recommendations for pedestrian overcrossings in several places along the corridor in the central part of the city. The Element preliminarily identifies three possible locations. Other possible solutionss include providing underpasses. Improved access across the highway is particularly important near American Canyon Road, as students on the western side must cross to reach American Canyon High School.

At the southern end of the corridor, pedestrian mobility is addressed through provision of Class I shared use bicycle/pedestrian paths through northern Vallejo and through to American Canyon Road. From American Canyon Road to Napa Junction Road, the nature of pedestrian facilities will depend on which option the City

proceeds with: sidewalks would be provided was part of the Boulevard option, and continuation of the Class I paths would be provided as part of the Modified Boulevard option. At-grade crossings will also be enhanced, with appropriate signal timing, enhanced crosswalk striping, and pedestrian refuges at medians. Urban design guidelines also recommend adequate lighting, street furniture such as benches and trash cans, and landscaping to enhance safety and comfort.

From Napa Junction Road to Jameson Canyon Road, where the recommendations are for the road to be improved as a Parkway, Class I pedestrian/bicycle paths continue on both sides. North of Jameson Canyon Road, the highway and the adjacent parcels take on a rural character, with very low density development of that is primarily agricultural and industrial in nature. From this point north, pedestrian access is not provided within the SR 29 right of way. Pedestrians wishing to continue north towards the City of Napa would continue on the Vine Trail, which continues north from this point, parallel to the highway on the west.

TRANSIT SERVICE

Bus Rapid Transit (BRT) Potential

Overview

Bus Rapid Transit (BRT) is typically defined as a flexible, rubber-tired rapid-transit mode that combines stations, vehicles, services, running ways, and Intelligent Transportation System (ITS) elements into an integrated system with a strong positive identity that evokes a unique image.[1] BRT service should be context sensitive and complement the built environment it serves; many BRT features and components can be implemented incrementally. Compared to local bus service, BRT improves upon speed, reliability, convenience, and identity. Full application of BRT is regularly compared to light rail transit (LRT) on rubber tires, but with greater operating flexibility and potentially lower capital and operating costs. This section explores the suitability of BRT in the SR 29 Corridor and investigates an incremental approach based on built environment thresholds.

Features

The key features of BRT include dedicated running ways, distinctive stations, distinctive easy-to-board vehicles, off-vehicle fare collection, use of ITS technologies, and frequent all-day service. The spacing of stations along freeways and busways typically ranges from 2,000 to 7,000 feet. Spacing along arterial streets ranges upward from about 1,000 feet to over 4,000 feet. Table 4-10 presents the typical features of BRT systems.

Incremental Development

BRT can be phased, with non-capital intensive service improvements implemented prior to major transit and roadway infrastructure changes. Many transit agencies operate "Rapid" style service, which embodies many BRT ele-

Currently, the Study Area is served by traditional bus. Adjacent densities are not yet high enough to support BRT.

1 *TCRP Report 90, Bus Rapid Transit Volume 1: Case Studies in Bus Rapid Transit, Transit Cooperative Research Program, 2003.*

TABLE 4-10: GENERAL CHARACTERISTICS OF BUS RAPID TRANSIT	
Feature	**Description**
Dedicated running way	Curb lane bus only, median bus lanes, grade separated. Queue jumps, queue bypass.
Stations	High capacity, pedestrian crossings, low floor boarding, fewer stops
Identity and branding	Branding of infrastructures, vehicles, and routes
Vehicles	Low floor, high capacity, articulated
Fare collection	Off-board fare collection
ITS	Signal priority, signal preemption, AVL, APC, real time passenger information (e.g. NextBus)
High frequency service	5-15 min peak service, service at least 16 hours/day
Service and reliability	Greater reliability and higher operating speeds than local bus routes
Even Boarding	Platforms and/or low floor bus-curb loading to improve boarding and alighting times

Source: Fehr & Peers, 2013

ments but does not include major capital investment such as dedicated running ways or enhanced stations. Metro Rapid (Los Angeles), VTA Rapid (Santa Clara County), AC Transit Rapid (Alameda County), and RapidRide (Seattle) are examples of Rapid or ("BRT 1") systems. Service elements of Rapid or BRT 1 type service include:

- Low floor, high capacity, articulated vehicles with unique branding
- Signal priority and real time passenger information
- Fewer stops
- Reliability and operating speed improvements
- Mixed flow or peak period bus lanes

"Full" BRT/BRT 2 is capital intensive and typically includes dedicated running ways comparable to LRT service. In addition to Rapid style service elements, Full BRT typically involves major construction and ROW acquisition. Full BRT may serve as a means of establishing the transit market for a possible future rail line. In addition to the features identified above for Rapid/BRT1 service, the following features characterize Full BRT/BRT 2:

- Dedicated lanes – center or side running
- Queue jump/queue bypass lanes
- Enhanced stations
- Off-board fare collection

Cost

BRT costs reflect the location, type, and complexity of construction. In TCRP Report 90, which studied 26 systems, reported median costs were $6.6 million per mile for arterial median busways (Full BRT/BRT 2) and $1 million per mile for mixed traffic or curb bus lanes (Rapid/BRT 1).[2]

Transit Market

BRT is best suited for urban areas and should serve demonstrated transit markets. Urban areas with more than a million residents and a central area of employment of at least 75,000 are good candidates for BRT. These areas generally have sufficient corridor ridership demands to allow frequent all-day service.

VTA (Santa Clara County) developed service design guidelines for determining feasibility of BRT along arterial corridors (Table 4-11). These guidelines serve as a proxy for the land use intensities (population, employment and performance) needed along the SR 29 corridor for viable BRT service.

Currently, typical residential densities along the SR 29 Corridor range, on the high end, from pockets of development up to 20 dwelling units per acre in Vallejo to 5-12 dwelling units per acre in American Canyon, and on the low end, less than 1 dwelling unit per acre in unincorporated

2 *TCRP Report 90, Bus Rapid Transit Volume 1: Case Studies in Bus Rapid Transit, Transit Cooperative Research Program, 2003.*

TABLE 4-11: GUIDELINES FOR BRT FEASIBILITY		
Service Standard	**Rapid/ BRT 1**	**Full BRT/ BRT 2**
Boardings per revenue hour	45	55
Daily Boardings per route mile	200	350 to 475
Residential density (DU/acre)	12-16 (min) to 30-50 (optimal)	
Employment density (FAR)	1.0 (min) to 2.0 (optimal)	

Source: Fehr & Peers, 2013

Napa County. Residential densities in the City of Napa within a half-mile of the corridor are typically less than 8 dwelling units per acre with pockets of denser multifamily development.

Non-residential density exceeds 2.0 FAR in Downtown Vallejo and some areas of the City of Napa. However, most non-residential development in northern Vallejo and American Canyon is developed at less than 1.0 FAR, characterized by single-story commercial centers with surface parking. Business parks in the north of American Canyon and near the airport are at a similarly low intensity in order to comply with airport land use compatibility restrictions.

While development density/intensity in the study corridor does not support BRT at this time, it should be noted that the roadway improvements proposed in this report do not preclude implementation of BRT in the future. Through American Canyon, the Modified Boulevard concept would lend itself more easily to creation of shared BRT/HOV lanes than the Boulevard concept.

Passenger Rail

The passenger rail concept for the SR 29 Corridor is still conceptual at this point, but it should be recognized as a potential transportation alternative. The route would travel from (or at least near to) the Vallejo Ferry Terminal to the town of St. Helena. The projected ridership would not meet standard thresholds for established public funding sources. In addition, Napa County is located in a Small Urbanized Area (UZA) and is only eligible for generating 5307 funds based on population and not on revenue-miles. Likewise, as a small UZA, Napa would not generate FTA 5309 fixed guideway funds, which is a critical fund source for continued maintenance of the system. Alternatively, interest has been shown in the possibility of private funding for elements of a rail solution in the corridor.

The following briefly presents advantages and disadvantages to pursuing passenger rail for the study area.

Advantages:

- Greater reliability, shorter travel times compared to bus transit, potentially automobile (esp. during peak periods with high levels of congestion)
- Ability to attract choice riders, serve tourist market as well as commute and other home based or non-home based trips
- Significantly greater ridership than corridor bus service

Disadvantages:

- High capital and operating costs
- Land acquisition may be needed for stations and park-and-ride
- First mile/last mile concerns – ¼ mile to ½ mile typical maximum walking distance from rail transit, low density pattern of Napa County would make many destinations unreachable from stations (NCPTA could increase feeder bus service, which would also come at a cost)

Transit Recommendations for the SR 29 Corridor

Given the current characteristics and developed density of the study area, the SR 29 Corridor in Napa County is not likely to be a candidate for BRT service without major policy intervention to develop a dense adjacent built environment. There is potential for both American Canyon and Vallejo to see increases in density through proactive policy planning, as both cities have designated Priority Development Areas (PDAs) by ABAG/MTC, meaning that they are intended to intensify so as to better support transit. ABAG/MTC give priority to PDAs when issuing technical assistance and capital grants, in exchange for a community's commitment to compact growth and development at densities and configurations that support alternative modes of travel.

Transit service on SR 29 provided by NCTPA currently includes local (Route 11) and express (Route 29) service. Alternative options to improve speed, reliability, and customer experience of the existing transit services along the corridor and thus increase ridership include:

- Allow transit to operate in the shoulder to bypass congestion
- Construct queue bypass lanes at congested intersections
- Provide real time passenger information and enhanced stops
- Develop Park and Ride lots at strategic locations

While a dedicated bus lane or High Occupancy Vehicle (HOV) lane is not recommended for the corridor at this time, the six lane configuration of the highway from Jameson Canyon Road through American Canyon would not preclude development of a High Occupancy Toll (HOT) or HOV lane, or the development of a BRT system in the future. This possibility is left open for further evaluation in the future, as both land uses and travel along the corridor intensify.

Additional opportunities exist to improve transit frequency along the corridor by partnering with Soltrans, the public transit service provider that operates in Vallejo that already provides service to the Wal-Mart in American Canyon. With some modest capital investments such as park and ride lots, queue jumps at strategic locations, and signal pre-emption, bus transit operations in the corridor could be significantly improved and potentially encourage modal shifts from cars to transit.

In addition, it is anticipated that other roadway and intersection improvements, described in Section 4.2, will also result in improved bus service along the corridor. When buses do not operate in dedicated lanes, their speed and schedule reliability is significantly affected by the automobile traffic among which they travel. By improving overall traffic conditions along SR 29, bus transit also benefits.

Finally, similar to walking and bicycling, use of public transit contributes to reducing greenhouse gas emissions and supports State goals for addressing climate change. Together with additional programs to reduce traffic congestion and dependency on single-occupancy vehicles, such as Transportation Demand Measures, the recommendations in this plan support the greenhouse gas reduction goals of Napa County and other participating jurisdictions.

COMMUNITY CHARACTER RECOMMENDATIONS

Overall Design Elements of a Gateway Corridor

The Gateway Corridor Improvement Plan focuses on creating an attractive and functional entry to Napa County and enhancing the image and economic vitality of corridor communities. A unifying "gateway" theme should be explored in future design treatments, taking into account Caltrans guidelines for signage.

As noted previously in the Plan, each of the communities has somewhat different visions and policies in place: for Vallejo, SR 29 is a community entry and transition area that includes a mix of residential, commercial, and open space land uses; in American Canyon the corridor extends through the heart of the community, and is a potential showpiece for this rapidly-growing young city; in Napa, SR 29 is a parkway-like edge for the historic urbanized area; County lands between American Canyon and Napa are a complement to up-County's agricultural and light industrial land uses, and open space landscape.

Each of these different visions is expressed in the Roadway Type(s) established to guide circulation planning and roadway design improvements. The visual quality of buildings, site improvements, and landscape is important as an expression of the character of local communities and Napa County. The general guidelines that

follow are intended to help ensure that future land use, development, and roadway improvements complement one another to fulfill the vision for each specific corridor area. The guidelines provide basic parameters that bolster, supplement, and/or parallel existing urban design policies.

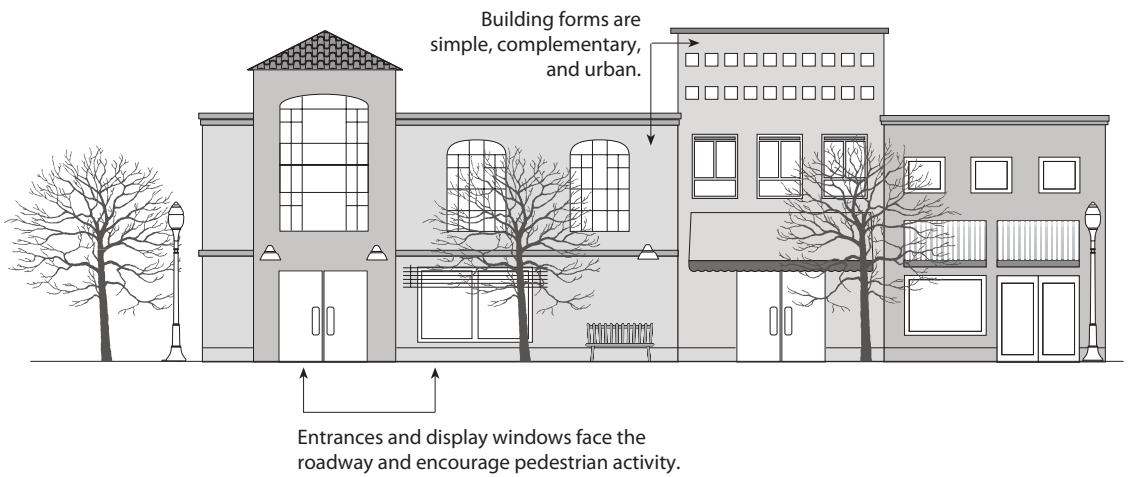
Urban Design Guidelines by Roadway Type

Boulevard and Modified Boulevard

The Boulevard and Modified Boulevard roadway types both are intended to create public spaces that are active and attractive, sufficient to support a consistent frontage of high-quality mixed-use development. Street-facing buildings, particularly street-facing first floor commercial space, and a strong and regular arrangement of street trees and streetlights, are fundamental elements that give this roadway type its character.

- *Buildings* – Buildings should face the roadway, with attractive and visible main entrances and display windows that encourage pedestrian activity and are characteristic of a boulevard street. Facades should parallel sidewalks, with a minimum two-story height to frame the street space and minimal massing changes and/or building step-backs along the frontage. The highest quality windows, façade surface and roof/cornice materials should be displayed along SR 29. Building forms should generally be simple, complementary, and urban, typical of a downtown commercial area, rather than dramatic, one-of-a-kind structures.
- *Setbacks* – Commercial buildings should generally abut expanded frontage sidewalks in order to create a consistent boulevard building frontage, particularly if they contain first floor commercial space. Office and residential buildings may be set back to create a small forecourt, but setbacks should be no greater than 20'.
- *Parking* – In order to support a consistent building frontage, surface parking lots should be located behind or to the side of buildings, not in front. Alternatively, as local frontage driving lanes do not include curbside parking, surface parking should be located to the side of buildings to support a street-facing/building corner main entrance; rear parking lots typically result in rear-facing main building entrances.
- *Landscape* – Sidewalk and frontage lane street trees provide a visual structure along the roadway. Planters and other smaller scale landscape features may be appropriate along frontage sidewalks; however, in general, frontage sidewalks should be gracious and open, offering visibility of frontage businesses and signs from SR 29 and the frontage lane (if present). Surface parking lots that abut frontage sidewalks should include "orchard" shade tree plantings, trellises, and/or other features to screen parking areas and low, attractive fences or walls to frame the sidewalk/street space.

Street landscaping and lighting concepts for boulevard roadway types



Building form, parking location, and setbacks for boulevard roadway types

- *Lighting* – The Boulevard should be bright and inviting, with closely-spaced pedestrian-oriented street lights along frontage sidewalks. Attractive façade and sign lighting is encouraged. Transit stops and other important locations should be highlighted with special lighting. All lights should include "high cutoff" fixtures that direct illumination toward road and sidewalk surfaces and reduce glare and dark sky impacts.
- *Street Furniture and Amenities* – Benches, bicycle racks, trash receptacles, canopies/shade structures and other elements that make sidewalk frontages attractive and pleasant are recommended. In general, amenities should be concentrated near intersections and other areas with high levels of pedestrian activity.
- *Transit* - Bus stops should include attractive, highly visible shelter structures that protect patrons from the elements and complement adjacent commercial businesses. Ideally, these and other facilities would be signature urban design elements that promote a positive district identity and image.

Parkway

The Parkway roadway type relies on attractive, relatively dense, and informal landscape plantings to blend, screen, and/or enhance a range of adjacent land use and development types, from light industrial to office and multi-family housing. This park-like landscape zone provides the

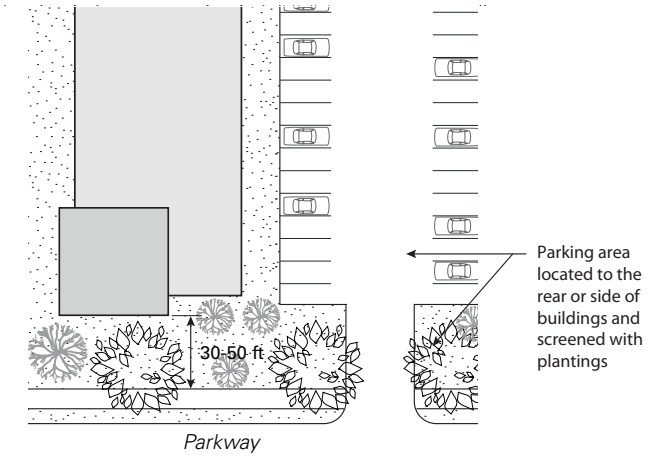
unifying element for this roadway type, rather than buildings and/or other features.

- *Buildings* – In general, buildings should face SR 29, as recommended for the Boulevard roadway type. Buildings should not abut frontage sidewalks, but should generally be sited with the front façade parallel to SR 29. Architectural forms may vary from urban to suburban, traditional or contemporary. Materials and detailing should reflect the general Napa Valley character expressed in the best recent construction in the area.
- *Setbacks* – A generous landscape setback area is the unifying element of the Parkway roadway type. In general, building and parking area setbacks should range from 30 to 50 feet from the frontage shared use path. An informal planting of large shade trees and understory species should be established that creates a green edge along the roadway and frames frontage property development.
- *Parking* - Surface parking lots should be located behind or to the side of buildings, not in front, to maintain a consistent area of setback landscaping along the frontage. Surface parking lots should include "orchard" shade tree plantings, trellises, and/or other features to screen parking areas and reinforce the parkway character.
- *Landscaping* – The Parkway concept relies on park-like landscaping between the roadway and development. In general, this would consist of lawn areas, shade trees, and garden areas with flowering trees, shrubs, and other ornamental plants. However, in the SR 29 corridor, this approach needs to be adapted to address potential drought conditions and water conservation policies. Drought tolerant and/or native grasses, trees, and shrubs should be employed, creating a "dry California" parkway landscape.
- *Lighting* – High roadway light levels are not required in Parkway areas. Light fixtures should be provided at regular intervals, but light levels should be noticeably lower than those provided for the Boulevard type areas. However, consistent pedestrian- and bicycle-oriented lighting should be provided along the frontage shared use path, with supporting illumination provided by adjacent buildings, and related parking areas, walkways, and/or other facilities. All lights should include "high cutoff" fixtures that direct illumination toward road and sidewalk surfaces and reduce glare and dark sky impacts.
- *Street Furniture and Amenities* – Benches, trash receptacles, bus shelter/shade structures, and other amenities should be provided along the shared use path at regular, approximately quarter-mile, intervals.

Landscaping for parkway roadway types

Rural Highway

The Rural Highway roadway type occurs between communities and/or between other roadway types. Ideally, it serves as a border area that puts the agricultural landscape of Napa County on display. Adjacent agriculture and agriculture-related structures and facilities should be visible and attractive, with frontages lined by grape vine trellises, agricultural-type fencing, and/or other elements typical of the Napa Valley's rural and wine country areas.



Parking location and setbacks for parkway roadway types

Agricultural landscape, building setback and character along rural highway

Landscaped swale along rural highway

- *Buildings* – The Rural Highway roadway type is not dependent on buildings or site improvements per se for urban design character. The agricultural landscape is the primary element. Buildings are anticipated to be primarily functional in nature; e.g. barns, storage and equipment sheds as needed to support agricultural activities. Some industrial buildings may also be present. However, buildings should be attractive examples of their particular type, consistent with the best examples in other agricultural areas of Napa County, and buildings and/or fencing should be sited so that outdoor storage areas, equipment-servicing yards, and other potentially unsightly facilities are screened from view from the roadway.
- *Setbacks* – Agriculture-related buildings and outdoor work areas should have significant setbacks from SR 29; a minimum of 100' is recommended to allow for agricultural uses adjacent to and along the roadway.
- *Parking and Outdoor Storage* – Large parking areas are not anticipated adjacent to the Rural Highway condition. Smaller employee parking and outdoor storage/work areas should be screened from view and setback from the roadway frontage, as noted above. If large parking areas are required—e.g., to serve tasting rooms—shade tree plantings should be provided, similar to recommendations for the Parkway.
- *Landscaping* – A planted swale and frontage shade trees would be provided as part of roadway improvements. On-site landscaping is not as important or as strongly recommended as it is for the other roadway types. If on-site landscaping is provided, it should follow the recommendations for the Parkway roadway type, above.
- *Lighting* – Lighting in the Rural Highway should be minimal, provided only for security and/or to support agricultural activities. All lights should include "high cutoff" fixtures that direct illumination toward road and sidewalk surfaces and reduce glare and dark sky impacts.

Implementing Community Character Recommendations

The community character recommendations described here are best implemented through the development of design guidelines and/or amendments to individual jurisdictions' zoning ordinances. As American Canyon proceeds with the Specific Plan for the PDA area along its segment of the corridor, these recommendations should be reflected through community design policies and implementing ordinances. American Canyon's Specific Plan should also consider evaluate increases in allowable density and housing along the corridor in order to meet the PDA housing requirement and support increased transit use, per MTC's requirements for the PDA designation, so as to make the urban environment along the Modified Boulevard segment more viable.